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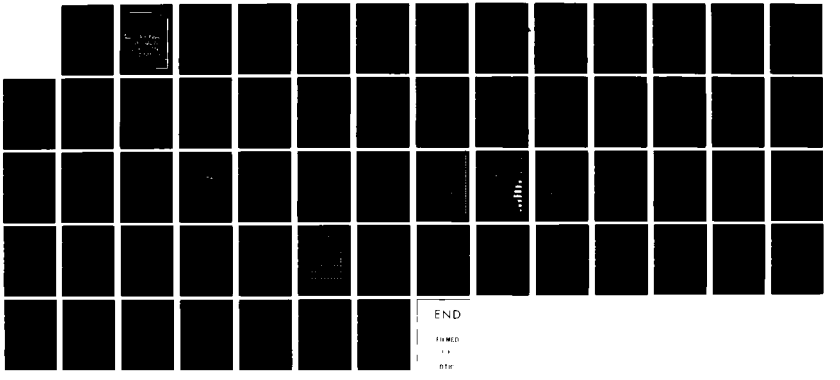

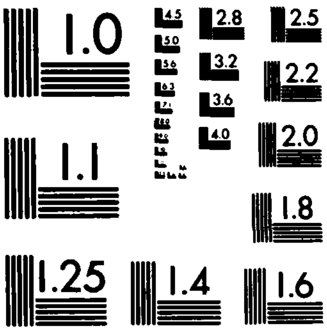

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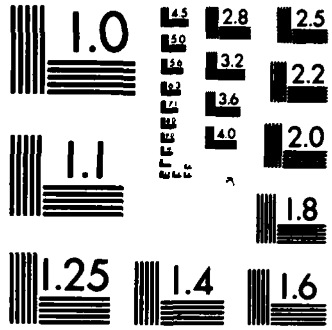

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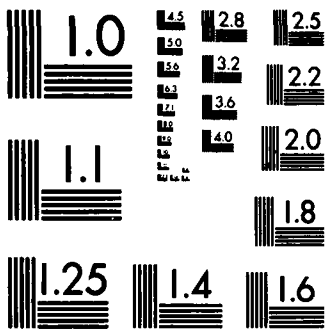

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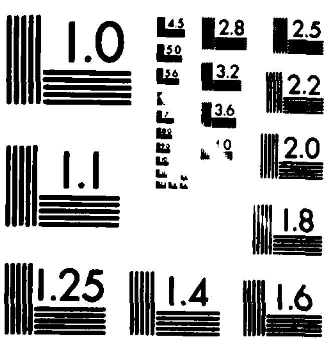

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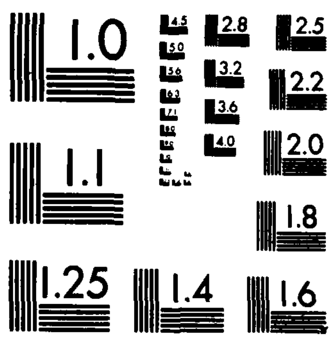

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Report on 1980 Activities

ARKANSAS RIVER BASIN COORDINATING COMMITTEE

U.S. ARMY CORPS OF ENGINEERS

SOUTHWESTERN DIVISION Reservoir Control Center

JANUARY 1981

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This annual report describes the water control activities within the Arkansas River Basin during the year. A brief description of the basin regulation plan is also included.

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The Arkansas River Basin Coordinating Committee consists of official representatives of the following State and Federal Agencies:

STATES

Kansas

Oklahoma

Arkansas

FEDERAL

Corps of Engineers

Department of the Interior

Environmental Protection Agency

Federal Energy Regulatory Commission

Soil Conservation Service

Southwestern Power Administration

ARKANSAS RIVER BASIN COORDINATING COMMITTEE
REPORT ON 1980 ACTIVITIES

PLATES

EXHIBITS

ARKANSAS RIVER BASIN COORDINATING COMMITTEE
REPORT ON 1980 ACTIVITIES

I. PURPOSE AND SCOPE

The Arkansas River Basin Coordinating Committee was organized on 20 March 1970. The purpose of this committee is to provide coordination between state and Federal agencies in the regulation of the water resources of the Arkansas River Basin downstream from Great Bend, Kansas. The Committee requested that a report be prepared each calendar year to provide a summary of the regulation activities for the past year.

The report, prepared in January of each year, summarizes the actual regulation of the Arkansas River Basin reservoirs and navigation system for the previous calendar year. It provides members historical data to use in appraising the results of the past year's regulation and can be used in communicating with their agencies. The report also contains a general summary of planned activities for the coming year.

II. INTRODUCTION

A. The Basin. The Arkansas River Basin has a drainage area of 160,576 square miles. From its source on the eastern face of the Rocky Mountains near Leadville, Colorado, the Arkansas River flows southeasterly through Colorado, Kansas, Oklahoma, and Arkansas, to join the Mississippi River at a point about 575 miles upstream from the Head of Passes, on the Mississippi River. From its source at about elevation 14,000 feet, msl, the fall of the river ranges from 110 feet per mile near Leadville, Colorado, to 2.2 feet per mile at Tulsa, Oklahoma, and 0.4 foot per mile near the mouth. Major tributaries of the Arkansas River are the Salt Fork of the Arkansas, Cimmaron, Verdigris, Grand (Neosho), Illnois, Canadian, Poteau, Petit Jean, and Fourche La Fave Rivers. Plate 1 shows the basin and location of the existing projects.

The upper portion of the basin in Colorado is mountainous and the stream flows through deep gorges and narrow valleys with steep gradients. Below Pueblo, Colorado, the valleys with steep gradient decreases. Below Great Bend, Kansas (river mile 873.2), the river is crooked and subject to shifting channels. Below the mouth of the Verdigris River, the bank stabilization and channel rectification works now provide a stable channel, suitable for modern barge traffic. Former river channels can be seen several miles from the present stabilized river channels.

The mean annual precipitation ranges from 12 inches in the western portion of the basin to 52 inches at the mouth. The greatest amount of precipitation occurs in late spring and early summer in the western portion of the basin and in late winter and early spring in the eastern portion of the basin. The normal precipitation for selected stations is shown in table 1. The mean annual snowfall ranges from 21 inches near Dodge City, Kansas, to 3 inches in the eastern portion of the basin.

TABLE 1

NORMAL PRECIPITATION

(1941-1970)

	DODGE CITY, KS	WICHITA KS	TULSA OK	FORT SMITH AR	LITTLE ROCK AR
January	0.50	0.85	1.43	2.38	4.24
February	0.63	0.97	1.72	3.20	4.42
March	1.13	1.78	2.52	3.64	4.93
April	1.71	2.95	4.17	4.74	5.25
May	3.13	3.60	5.11	5.48	5.30
June	3.34	4.49	4.69	3.93	3.50
July	3.08	4.35	3.51	3.24	3.38
August	2.64	3.10	2.95	2.91	3.01
September	1.67	3.69	4.07	3.31	3.55
October	1.65	2.50	3.22	3.47	2.99
November	0.59	1.17	1.87	3.08	3.86
December	0.51	1.12	1.64	2.89	4.09
Annual	20.58	30.58	36.90	42.27	48.52

The average annual runoff varies from less than 0.5 inch in the western plains to 18 inches in central Arkansas. Floods occur more frequently during spring months, but records show that large floods may occur at anytime during the year. The recorded flows at Little Rock have ranged from a low of 850 cfs on 23 August 1934 to a high of 536,000 cfs on 27 May 1943. The average recorded flow at Little Rock for a 53 year period ending 30 September 1980 is 40,600 cfs (29,415,000 acre-feet per year).

B. Development. Federal development of the Arkansas River Basin water resources downstream from Great Bend, Kansas, began with the 1936 Flood Control Act (P.L. 738, 74th Congress). A comprehensive report of possible plans of development of the Arkansas River and tributaries for flood control and other uses was published in 1936 as House Document No. 308, Law No. 525, (79th Congress, 2d Session) as amended by Flood Control Acts of 1948 and 1950, authorized plans for comprehensive development of the Arkansas River and tributaries. The approved plan provides for development of the river for navigation, hydroelectric power, flood control, and allied benefits.

There are currently 25 federally constructed reservoirs on the tributaries and 5 on the main stem. Six reservoirs (Arcadia, Big Hill, Candy, Copan, El Dorado, and Skiatook) are under construction. In addition to the reservoirs, channel improvements and 17 locks and dams have been constructed to provide navigation from the mouth of the Arkansas River to Catoosa,

Oklahoma. Construction began on the Arkansas River Navigation project in 1957. Navigation reached Little Rock in December 1968; Fort Smith in December 1969; and the Port of Catoosa, at the head of navigation, in December 1970. Pertinent data for these projects are shown on plates 2 and 3.

The Grand River Dam Authority has constructed three projects in the Lower Grand (Neosho) River Basin for hydroelectric power and flood control. These are Grand Lake (Penascola), Salina pump-back storage project, and Lake Hudson. In addition to the above mentioned projects, the Soil Conservation Service has constructed numerous dentention-type structures to control runoff on the small tributary watersheds.

III. SYSTEM WATER CONTROL PLAN & REGULATION GOALS

A. General. The approved water control plan for the individual projects in the Arkansas River Basin are contained in the water control manual for each project. During 1979, the selection of the System Regulation Plan for the operation of the Arkansas River Basin was made by Little Rock District, Tulsa District, and the Southwestern Division (SWD). The plan was also furnished to the committee members by letter, SWDED-XR, 9 October 1979. This plan for the system regulation of the projects in the Arkansas River Basin is contained in the master water control manual for the basin approved October 1980. A brief description of the adopted System Plan is presented in paragraph B. Any deviation or revision to these plans is subject to approval of the SWD, Reservoir Control Center (RCC). The goals accomplished are presented in paragraph C below.

B. System Water Control Plan. The System Water Control Plan provides for evacuation of water from flood storage at a variable rate which depends on the severity of the flood. The plan allows a reduction in the release when only the lower portion of the flood levels are utilized. This reduced release rate allows more of the water to be used for the production of power and aids navigation by providing a "taper" to extend the time flows can be held in the 20,000 to 40,000 cfs range. This "taper" in the release at the end of large floods provides additional time for dredging that may be required to restore the channel to design conservation pools, in order to extend the taper when necessary. The guide curve on plate 4 shows the regulated flow rate at Van Buren which varies according to the time of year and percent of basin storage utilized.

C. Goals for Various Purposes.

a. Fish and Wildlife Enhancement. The Fall River, Elk City, Toronto, Council Grove, John Redmond, Eufaula, Wister, Blue Mountain, and Nimrod Lakes are regulated for fish and waterfowl enhancement in addition to the other authorized project purposes. This is accomplished through use of seasonal pool levels. The plans for conservation pool level fluctuations are aimed at producing greater fish and wildlife harvests, and more fishing and hunting benefits.

b. Flood Control. The greatest portion of flood benefits in this basin are from damages prevented to crops and rural structures. About 60 percent of the benefits are obtained from rural areas and 40 percent from urban areas. The reservoirs are regulated according to the criteria prescribed by the plan of regulation for the system to make use of the available storage and downstream channel capacities.

c. Navigation. Arkansas River navigation from Tulsa to the mouth became a reality in December 1970. A navigable depth of 9 feet will be maintained whenever practicable.

d. Power Production. The eight Federal hydropower plants in the Arkansas Basin are integrated into a system of plants located in the Arkansas-White-Red River Basins. The power is marketed by the Southwestern Power Administration (SWPA). Constraints on power generation are designed to minimize loss of energy, meet design capability, and meet the operation requirements for all project purposes.

e. Recreation. Recreation is not an authorized project purpose in most of the reservoirs; however, its importance is highly recognized. Recreation benefits, though difficult to evaluate, are obviously present. When practical, project operations may be restrained to stabilize pools or limit pool fluctuations. The seven Corps lakes which have recreation as an authorized project purpose are Kaw, Birch, Council Grove, Marion, John Redmond, Optima, and Robert S. Kerr. There are also two Water and Power Resources Service (formerly Bureau of Reclamation) lakes, Cheney and Meredith, which have recreation as an authorized purpose.

f. Water Supply. Water supply storage in Federal reservoirs is allocated to a specific user. Reallocation of storage in an existing project from another purpose to water supply is possible under the Water Supply Act of 1958. Whenever a request for such a reallocation is received, the Corps of Engineers determines the amount of storage necessary to provide the required yield and the effect on all project purposes. The proposed reallocation is coordinated with other affected agencies.

g. Water Quality. Releases from projects containing water quality storage are made to meet current water quality flow requirements at downstream control points. Releases are also made for emergency conditions that may occur. Water quality improvement also occurs as a by-product of releases made to satisfy other project purposes.

D. Arkansas River Basin Compact; Arkansas-Oklahoma. The major purposes of this compact are:

a. To promote interstate comity between the States of Arkansas and Oklahoma.

b. To provide for an equitable apportionment of the waters of the Arkansas River between the States of Arkansas and Oklahoma and to promote the orderly development thereof.

c. To provide an agency for administering the water apportionment agreed to herein.

d. To encourage the maintenance of an active pollution abatement program in each of the two states and to seek the further reduction of both natural and manmade pollution in the waters of the Arkansas River Basin.

e. To facilitate the cooperation of the water administration agencies of the States of Arkansas and Oklahoma and the total development and management of the water resources of the Arkansas River Basin.

The major provisions of this compact provide for the apportionment of water between the two states based on a percentage of the annual yield.

E. Arkansas River Basin Compact; Kansas-Oklahoma. The major purposes of this compact are:

a. To promote interstate comity between the States of Kansas and Oklahoma.

b. To divide and apportion equitably between the States of Kansas and Oklahoma the waters of the Arkansas River Basin and to promote the orderly development thereof.

c. To provide an agency for administering the water apportionment agreed to herein.

d. To encourage the maintenance of an active pollution-abatement program in each of the two states and to seek further reduction of both natural and manmade pollution in the waters of the Arkansas River Basin.

The major provisions of this compact provide for water apportionment based on conservation storage capacity.

IV. SUMMARY OF 1980 REGULATIONS

A. General. The annual precipitation was below normal at every lake in the basin. The annual precipitation at lakes in the basin ranged from 31 to 81 percent of normal. The annual precipitation at selected index stations ranged from 61 to 96 percent of normal. The following stations are shown as an index for the basin:

	Precipitation - Inches		Departure
	1980	Normal	From Normal
Dodge City, KS	19.80	20.58	- 0.78
Wichita, KS	20.49	30.58	-10.09
Chanute, KS	24.11	39.66	-15.55
Tulsa, OK	33.33	36.90	- 3.57
Fort Smith, AR	26.46	42.27	-15.81
Little Rock, AR	39.25	48.52	- 9.27
Pine Bluff, AR	47.71	50.72	- 3.01

Starting in the fall of 1979 and continuing through 1980, below average amounts of rainfall have produced drought conditions in the Arkansas River Basin. The year began with the flows in the Arkansas River slightly below normal and lake levels around conservation pool. In the latter part of March flows increased to above normal and the average monthly flow at Van Buren was slightly above normal for the month of April. The main runoff producing storms for the year occurred from March through June. Since June the basin has experienced a severe drought. Low flows were generally less than 11,000 cfs at Little Rock through out this period with some flows as low as 800 cfs for durations of 2 to 3 days.

Ft. Gibson, Kaw and Wister were the only lakes that were not below top of conservation pool at the end of the year. Three projects had their lowest pool levels of record; Sanford recorded an elevation of 2880.30 on 31 December, Toronto recorded an elevation of 897.05 on 5 December and Birch which was placed in operation in 1977 recorded an elevation of 747.76 on 31 December. At the end of the year only minimum discharges for hydropower and water quality control were being made.

The total runoff at Van Buren gage for 1980 was 11.6 million acre-feet as compared to a normal 23 million acre-feet for the 53-year period through 1980. A tabulation of the 1980 maximum and minimum pool elevations for the lakes in the basin is shown on plate 2. The recorded annual and monthly flows for the Arkansas River at Dam No. 13, near Van Buren, Arkansas, are shown on plates 5 and 6. A graph of the outflow from Dam No. 13 is shown on plate 7. Graphs of pool levels are shown on plates 8 through 15 for Kaw, Keystone, Fall River, Elk City. Oologah, Council Grove, John Redmond, Pensacola, Fort Gibson, Tenkiller Ferry, Eufaula, Wister, Blue Mountain, and Nimrod Lakes.

The less than normal flows resulted in a generally improved water quality relative to 1979. Because of reduced tributary flows, navigation pools 2 and 5 were temporarily raised during the growing season to provide a limited amount of irrigation water. Drought conditions along the Mississippi River Basin have created imtermittent, navigation depth problems along the lower White River entrance channel to the McClellan-Kerr Navigation System. By use of dredging and tow size restrictions, the entrance has remained open to navigation. The continued low flows on the Mississippi River magnifies the importance of the long range forecasts for the Helena stage prepared each Tuesday by the Lower Mississippi River Division (LMVD). These forecasts are used by LRD to plan and schedule dredging on the White River entrance channel.

B. Fish and Waterfowl. The 1980 seasonal guide curve for Council Grove, Elk City, John Redmond, Toronto and Fall River were modified from the 1979 curves at the request of the Kansas State Water Resources Board. The objective of the modification was to improve fishery and wildlife benefits. A one year pool level manipulation plan for Eufaula Lake was approved starting in July 1980. This was to help evaluate possible improvement to fishery and wildlife benefits. Lack of sufficient inflows for the last six months of the year caused deviations from the seasonal curves at all five Kansas lakes and Eufaula Lake, particularly during the fall rise planned to enhance the waterfowl habitat and hunting. Minor deviations from the seasonal guide curves, due to special operations, are discussed in paragraph J, Special Operations.

During 1979, the commercial fish catch in the Arkansas River Basin (Arkansas and Oklahoma) was about 3.7 million pounds with a value of $1,232,000. In Oklahoma the mussel harvest was 1.34 million pounds and had a value of $450,600. In 1979 there were 36 licensed commercial fishermen in Oklahoma and 785 in Arkansas.

C. Flood Control. During the fiscal year ending 30 September 1980, the 27 Corps of Engineers and Section 7 flood control lakes prevented $21,654,000 in flood damages in the Arkansas River Basin. The flood damages prevented during the past 16 years are shown on Plate 16.

a. Above Fort Smith. Rainfall during the first three months of the year was relatively low throughout the basin, however, most lakes were maintained at the top of conservation pool until the last part of March and the first of April when a basin-wide storm occurred. The runoff from this storm increased the equivalent basin flood control storage utilized to 10 percent. The water control plan for the Arkansas River Basin contains a feature which if referred to as a "navigation taper". This "navigation taper" is used at the end of floods to extend the time that flows in the river below Van Buren can be held in the 20,000 - 40,000 cfs range. This provides time for dredging shoaled areas to restore the navigation channel to design dimension after a flood event. Two tapers were run in 1980 for the navigation system.

The first taper was from 30 March 1980 through 13 June 1980 with the maximum flow at Van Buren being 70,900 DSF on 3 May 1980. These releases were reduced in mid-April at Oologah, Hulah, Fort Gibson and R. S. Kerr to aid in the search for two bodies that went through the Lock and Dam 13 spillway. The second taper operation was 18 June 1980 through 11 July 1980 with Van Buren's maximum flow of 81,300 DSF occurring on 20 June 1980.

The following tabulation shows the date of peak pool, elevation, and percent full for the lakes affected by the April storm:

APRIL 1980 STORM

Lake	Top Conservation Pool Elevation (N.G.V.D.)	Maximum Pool Elevation (N.G.V.D.)	Maximum Flood Storage Utilized (%)	Date 1980
Kaw	1010.0	1020.28	22	5 April
Toronto	901.5	916.73	38	1 April
Fall River	948.5	958.91	15	1 April
Elk City	796.0	801.26	10	1 April
Oologah	638.0	642.31	14	4 April
Hulah	733.0	741.45	15	1 April
Council Grove	1274.0	1279.75	27	4 April
Marion	1350.5	1353.35	32	4 April
John Redmond	1039.0	1055.38	40	4 April
Fort Gibson	554.0	556.80	6	1 April
Keystone	723.0	726.27	7	12 April

N.G.V.D. = National Geodetic Vertical Datum of 1929

The experienced and natural stages at key stations are shown in the following:

Gage	Flood Stage (Feet)	Experienced Stage (Feet)	Natural Stage (1) (Feet)	Flooding Prevented (Feet)	Date 1980
Coyville	26.0	*	36.5	10.5	29 March
Altoona	23.0	*	25.4	2.4	31 March
Inola	42.0	*	45.3	3.3	31 March
Fall River	16.0	*	18.2	2.2	30 March
Fredonia	17.0	*	25.7	8.7	30 March
Hulah	32.0	*	33.5	1.5	30 March
Bartlesville	13.0	*	13.9	0.9	30 March
Ramona	26.0	*	29.1	3.1	31 March
Council Grove	14.3	*	23.0	8.7	30 March
Burlington	23.0	*	33.0	10.0	2 April

Gage	Flood Stage (Feet)	Experienced Stage (Feet)	Natural Stage (1) (Feet)	Flooding Prevented (Feet)	Date 1980
Iola	15.0	18.5	21.9	3.4	31 March
Parsons	22.0	24.5	28.3	3.8	2 April
Commerce	15.0	17.6	21.4	3.8	3 April
Kaw	944.5	*	951.7	7.2	31 March
Ralston	16.0	*	16.4	0.4	31 March

* Below bank full

(1) Natural stage would have occurred without the flood control lakes.

b. Below Fort Smith. There were four minor rises on the main stem of the Arkansas River during the period April through June. These are shown on plate 7. Successive rains during the spring continued to produce minor rises with the 6 April storm producing the largest natural rise of the season on the main stem below Fort Smith. The rise was due to rainfall in Oklahoma. The rainfall in the Little Rock District was very light. Under natural conditions flooding would have occurred at Van Buren only. The experienced and natural stages at key stations below Fort Smith are shown in the following tabulation:

STAGES AT KEY STATIONS

Gage	(NWS) Flood Stage	Experienced Stage (Feet)	Natural Stage (1) (Feet)	Approximate Reduction (Feet)	Date
Van Buren	22	19.8	24.5	4.7	6 Apr 80
Ozark	357	344.0	355.4	11.4	6 Apr 80
Dardanelle	32	16.0 (E)	25.5	9.5	7 Apr 80
Morrilton	30	15.3	27.3	12.0	8 Apr 80
Little Rock	23	9.2	16.8	7.6	8 Apr 80
Pine Bluff	47	33.3	37.4	4.1	9 Apr 80

(1) Natural stage would have occurred with no Corps of Engineers Reservoirs.

(E) Estimated using experienced discharge at Dardanelle Dam and Tailwater Rating Curve.

Runoff from rains which occurred between the latter part of April and 23 May was sufficient to cause Blue Mountain Lake and Nimrod Lake in the upper basin to rise into their flood pools. During this period the rainfall totaled 7.75 inches at Blue Mountain Dam and 6.49 inches at Nimrod Dam. On the Fourche LaFave River Basin (Nimrod Dam) two notable rises were experienced. Flood peaks on all the rises were reduced by regulation of Nimrod Dam. The maximum stage at the Houston gage for the

year crested at 22.6 feet on 22 May 1980. This was 1.4 feet below the critical flood stage of 24.0 feet and would have crested at 28.9 feet under natural conditions. A maximum of 29 percent of Nimrod Lake's available flood control storage was utilized in regulation of flood waters in 1980.

On the Petit Jean River Basin (Blue Mountain Dam), three notable rises were experienced during the year. The peak flows on these rises were reduced by Blue Mountain Lake. The maximum stage recorded at the Danville gage for the year was 19.3 feet on 17 May. This was 0.7 feet below the flood stage of 20 feet. Under natural conditions without Blue Mountain Lake, the stage would have been 22.7 feet. The maximum flood control storage utilized in Blue Mountain Lake during the year was 26 percent.

D. Navigation. Preliminary estimates indicate that about 9.1 million tons of commerce moved on the McClellan-Kerr Arkansas River Navigation System in 1980. This represents an increase of 2 percent above the 1979 level. Commodities consisted of bauxite, iron and steel, chemicals and chemical fertilizers, petroleum products, coal, sand and gravel, crushed stone, soybeans, wheat, other grains, and miscellaneous commodities. Inbound movements decreased by 21 percent and outbound movements increased by 34 percent. Commodities showing an increase in movement from 1979 were petroleum products, chemical fertilizer, and wheat. The increases for these commodities were 21, 17, and 84 percent, respectively. Historical tonnage movements are shown on plate 17. A comparison of the tonnage for 1979 and 1980 is as follows:

	1979* (Tons)	1980* (Tons)
Inbound	2,000,000	1,600,000
Outbound	3,500,000	4,600,000
Internal	2,900,000	2,400,000
Through	500,000	500,000
TOTAL	8,900,000	9,100,000

* Estimated

During 1980, the Arkansas River flows were generally excellent for navigation. The flows at Dam No. 2 were between 75,000 cfs and 150,000 cfs for 4 days and below 75,000 cfs the remaining time. Spring rains created rises on the Arkansas River which caused two minor shoals in the navigation channel. These shoals were dredged before flows decreased and navigation was not restricted.

It was necessary to raise navigation pools during the year to maintain navigation. Pool No. 7 and Pool No. 9 were raised for navigation depths on 11 July 1980. Both pools were returned to normal pool limits on 13 August 1980. Pool No. 7 was raised to limits of 250.0 to 250.3 on 8

October 1980 to provide navigation depths at N.M. 148. It was lowered 18 October 1980 to normal limits. Pool No. 2 was raised to limits of 162.5 to 163.0 on 8 July 1980 to provide backwater in Big Bayou Meto for emergency irrigation by local farmers. It was lowered on 30 September 1980. Pool No. 5 was raised to limits of 213.65 to 213.85 on 30 July 1980 to provide backwater for emergency irrigation along Plum Bayou. It was lowered on 6 September 1980.

The White River Entrance Channel was restricted to light draft vessels during daylight hours with width and length restrictions for 22 days during October, November, and December. There were also 14 days when depths were available but the channel was narrow requiring restrictions of tow size. These restrictions were caused by the low stages which were occurring on the Mississippi River.

Maintenance dredging to maintain navigable depths amounted to approximately 866,000 cubic yards in 1980. Of this amount, some 544,000 cubic yards were removed from the White River Entrance Channel. This was a decrease of about 434,000 cubic yards from the 1979 dredging requirements.

There were 19 groundings having a duration of more than 1 hour and 11 with a duration of less than 1 hour. There were 16 minor navigation related accidents during the year. Miter gates received minor damage when struck by commercial tows at Locks Nos. 2, 3, 4, 5, 9, and 13. A tower dolphin at Norrell Lock and Lock No. 2 was damaged by a commercial tow. Upstream dolphin at Lock No. 3 was damaged by a commercial tow. Guardwall damage was incurred at five locks and parapet walls were damaged at two others. Two mooring piles at Murray Park, located approximately one mile downstream from Murray Lock and Dam, were destroyed by a commercial tow.

E. Power Production. Tenkiller was the only hydropower storage project below its rule curve elevation at the beginning of 1980. During the spring runoff, the power storage was filled and water was stored in the flood pools at all of these projects. Below median inflows began in July and continued throughout the remainder of the year. The projects ended the year below their rule curve, ranging from 2½ feet below at Keystone to 8½ feet below at Tenkiller.

All three units at Webbers Falls Lock and Dam were taken out of service on 26 June 1980 for an indefinite time due to cracked shafts. The generation capability at Ozark was curtailed due to a variety of turbine mechanical problems which occurred throughout the year. The turbine service schedule for Ozark was:

Unit 1 in service	1 Jan 80 - 13 Aug 80
Unit 2 in service	26 Nov 80 - 31 Dec 80
Unit 3 in service	1 Jan 80 - 26 Nov 80
Unit 4 in service	10 Mar 80 - 6 Aug 80
Unit 5 in service	1 Jan 80 - 13 Aug 80

The monthly hydropower production for the eight Arkansas River Basin projects for the period 1978 through 1980 follows:

MONTHLY HYDROELECTRIC POWER PRODUCTION
ARKANSAS RIVER BASIN PROJECTS

Month	GWH 1978	1979	1980
Jan	111	84	134
Feb	170	102	168
Mar	335	310	214
Apr	327	353	350
May	386	358	322
Jun	358	348	280
Jul	169	322	155
Aug	85	180	66
Sep	60	107	47
Oct	19	52	12
Nov	41	208	10
Dec	44	219	22
TOTAL	2105	2643	1780

The annual hydropower production by project for five calendar years, 1976 through 1980, is shown in the following tabulation. A graphical presentation of the fiscal year generation at each of the projects is shown on Plates 18 through 25.

HYDROPOWER PRODUCTION (GWH)
ARKANSAS RIVER BASIN PROJECTS

	ACTUAL FOR CALENDAR YEARS					5-Year Average	
	1976	1977	1978	1979	1980	1975-1979	1976-1980
Keystone	151	205	183	284	229	236	210
Fort Gibson	161	202	193	242	119	213	183
Webbers Falls	173	214	182*	274*	133*	232	195
Tenkiller	101	36	95	82	39	97	71
Eufaula	162	79	147	173	125	192	137
R.S. Kerr	411	469	474	568	393	525	463
Ozark	186*	308*	272*	286*	262*	304	263
Dardanelle	509	612	559	734	480	630	579
TOTAL	1854	2125	2105	2643	1780	2429	2101

* Forced outages (30 days or more) of 1 or more units due to mechanical problems.

F. Recreation. The lakes and navigation pools in the Arkansas River Basin provide vast expanses of water shoreline for use in meeting the growing demands for water-associated recreation. The natural beauty of the area is considered in planning public use areas at these lakes. Recreational development plans are coordinated with state and Federal park, fish and wildlife, and archaeological agencies.

Special efforts were made to hold the flows at Van Buren to 20,000 cfs on 10 and 11 May for the annual canoe, sailboat, and bassboat races which are sponsored by the Junior League of Fort Smith. Special releases were made from Robert S. Kerr and W.D. Mayo on 30 August for the United Way raft race at Fort Smith, Arkansas. There were an estimated 10,000 spectators present for this event. Releases were made from Keystone Lake for the annual Labor Day raft race at Tulsa, Okalhoma. There were an estimated 50,000 spectators present for this event.

The Little Rock District, Corps of Engineers held a statewide lake and river shoreline cleanup day on 6 September 1980. It was considered to be highly successful in all areas. On the Arkansas River, Blue Mountain Lake, and Nimrod Lake there was a total of 3,180 participants. There were 21 sponsors and numerous organizations involved. A total of approximately 328 cubic yards of litter was collected along the Arkansas River, Blue Mountain, and Nimrod Lake. The statewide cleanup is planned to be an annual event with participation by the State of Arkansas.

The overall lake attendance for 1980 was approximately 13 percent less than for 1979. The notable decreases in attendance were primarily attributed to the economic conditions and exceptionally light rainfall. The Fort Gibson attendance was affected by poor fishing and the discovery of PCB contamination in fish and sediment of the lake. Lake attendance for the period of 1976 through 1980 is summarized in the following tabulation. The lake attendance includes visitation to the lake and associated parks for various recreational and sports activities.

ARKANSAS RIVER BASIN LAKE ATTENDANCE
(1000's of People)

Lake	Calendar Year 1976	1977	1978	1979	1980
Cheney (1)	601	585	662	551	(3)
Great Salt Plains	914	793	930	992	719
Keystone	4,129	3,873	4,179	4,156	4,113
Heyburn	1,124	792	501	709	420
Toronto	634	578	420	357	313
Fall River	520	493	433	372	277
Elk City	686	489	508	293	295
Oologah	1,781	1,841	1,801	2,144	1,992
Hulah	1,125	989	678	580	531
Birch	-	79	111	225	348

ARKANSAS RIVER BASIN LAKE ATTENDANCE (CONT)
(1000's of People)

Lake	Calendar Year 1976	1977	1978	1979	1980
Council Grove	1,060	917	719	649	449
Marion	928	806	693	420	415
John Redmond	528	623	455	277	380
Grand Lake (Pensacola)(2)	1,257	1,259	1,209	1,118	836
Lake Hudson (Markham Ferry)(2)	41	44	64	29	112
Fort Gibson	3,570	6,944	7,228	4,451	3,040
Tenkiller Ferry	5,668	6,514	4,064	4,594	3,676
Lake Meredith (Sanford)	1,826	1,631	1,782	1,850	1,581
Lake Thunderbird (Norman) (2)	1,730	1,998	1,329	2,147	(3)
Optima	-	6	33	37	58
Fort Supply	948	721	674	732	720
Canton	2,728	2,843	3,018	2,842	3,417
Eufaula	5,387	6,319	7,242	6,455	4,240
Wister	1,075	1,024	1,087	1,219	941
Blue Mountain	223	223	184	228	231
Nimrod	495	440	444	427	476
Newt Graham L&D	500	726	646	500	606
Chouteau	360	488	534	517	396
Webbers Falls	583	1,142	1,243	994	749
Robert S. Kerr	1,055	1,192	1,834	1,404	1,133
W. D. Mayo	282	228	296	302	229
L&D No. 13	599	675	757	882	1,082
Ozark (Jeta Taylor) L&D	860	953	1,022	1,080	1,102
Dardanelle L&D	2,778	3,259	3,441	3,492	3,341
L&D No. 9	354	345	403	413	356
Toad Suck Ferry L&D	530	541	680	686	686
Murray	811	819	1,005	1,000	1,054
David D. Terry	824	1,570	1,195	1,173	1,540
L&D No. 5	255	176	314	240	330
L&D No. 4	615	197	182	499	383
L&D No. 3	231	231	206	194	142
L&D No. 2	639	488	446	379	344
Norrell L&D	68	36	49	54	62

(1) Attendance shown was furnished by Kansas Park & Resource Board

(2) Attendance shown was furnished by Oklahoma Tourism & Recreation Department. This is for state parks only.

(3) Not available at publication time.

G. Water Supply. Water supply storage space is allocated in 17 of the existing Corps of Engineers lakes in the basin. Contracts for all or portions of this space are in effect at all of these lakes except Optima and Birch. During 1980 a total of 118,309 acre-feet of water was supplied from the storage space in these lakes. This amount is about 69 percent more than the amount used in 1979. The following tabulation shows the lakes which have water supply storage.

Reservoir	Water Supply			Water Supplied (ac-ft)	
	Allocation (ac-ft)	Contracts (ac-ft)	Number of Contracts	1979	1980
Kaw	171,200	39,350	1	None	4,357
Keystone	20,000	18,450	4	1,752	8,325
Heyburn	2,000	2,000	3	645	1,360
Toronto	400	265	1	89	89
Elk City	24,300	24,300	1	None	None
Oologah	342,600	54,230	8	35,666	47,581
Hulah	19,800	17,700	2	7,631	4,765
Birch	7,600	None	None	None	None
Council Grove	24,400	24,400	1	None	None
Marion	38,300	38,300	1	None	None
John Redmond	34,900	34,900	1	None	12,219
Fort Gibson	None	None	None	15,127(1)	16,210(1)
Tenkiller Ferry	25,400	18,649	33	4,404	5,066
Optima	76,200	None	None	None	None
Fort Supply	400	400	1	210	248
Canton	107,000	90,000	2	16,207	29,690
Eufaula	56,000	2,668	19	1,317	1,652
Wister	9,600	6,400	2	2,282	2,687
Nimrod	None	33	1	76	68

(1) Water supplied to satisfy pre-project water rights

(2) Water supply - 38,000 acre-feet; Irrigation - 69,000 acre feet.

(3) Water supply - 38,000 acre feet; Irrigation - 52,000 acre-feet (currently being used for W.S. by Oklahoma City).

Below Fort Smith water from the Arkansas River and tributaries was used extensively for crop irrigation during the drought of 1980. Numerous intakes were installed at locations throughout the river's length below Fort Smith. Crops irrigated included rice, cotton, and soybeans.

H. Water Quality. A Corps of Engineers dredge material sampling program along the Arkansas River is continuing to determine if dredging areas are polluted according to Environmental Protection Agency (EPA) criteria. Thus far, all area samples have fallen within safe limits established by EPA and no dredging operations would be prohibited by these criteria. Water quality monitoring along the Arkansas River and many of its tributaries is performed by the U. S. Geological Survey (USGS) and the Arkansas Department of Pollution Control and Ecology on a regular basis. Data for various reaches of the river are available from those agencies.

a. Above Fort Smith.

(1) The Tulsa District has completed detailed water quality studies on Webbers Falls, Birch, Oologah, Fall River, Elk City, Eufaula, Heyburn, and Hulah Lakes. No significant water quality problems were identified at any lakes except Webbers Falls. There, PCBs were found in some fish at levels above 5 ppm. The Oklahoma State Department of Health was notified and concluded the levels were not a problem. Final reports are available for four of these studies with the other four available in early 1981.

(2) A special study is being conducted on Kaw Lake to determine spatial distribution of Trihalomethane Formation Potential (TFP). The Trihalomethane Formation occurs when water containing certain carbon compounds is chlorinated. Elevated readings have been found and it may require expensive activated carbon treatment of the water prior to muncipal use. A final report will be available in late 1981.

(3) Releases from Tenkiller Lake were continued on the same regular schedule as in past years for the purpose of trout fishing below the dam.

b. Below Fort Smith.

(1) In general water quality on the Arkansas River main stem during 1980 was improved relative to 1979. While the total salt load has not diminished greatly, the extremes of concentrations have been leveled out due to the flow regulation features of the project.

(2) The City of North Little Rock has upgraded its Faulkner Lake treatment plant and has completed construction of the new White Oak Bayou Plant to replace a primary treatment plant on Shillcutt Bayou near Burns Park. The City of Little Rock is beginning a project

to add significant new wastewater collection and treatment facilities. These projects should cause improvement in water quality in the Little Rock area.

(3) During periods of low or zero natural flow in the Petit Jean River and Fourche LaFave River, a release of not less than 5 cubic feet per second is made from Blue Mountain and Nimrod Lakes. These releases provide water to the natural pools in the rivers and aid in maintaining fish life.

(4) Water quality monitoring of Nimrod and Blue Mountain Lakes continues on a limited but regular basis by Little Rock District. Persistent turbidity in both lakes and periodic hydrogen sulfide appearance in Nimrod are the most notable problem areas in these lakes.

I. Sedimentation. Maintenance dredging in the McClellan-Kerr Arkansas River Navigation System during 1980 was about 0.4 million cubic yards less than the dredging required in 1979. The following tabulation shows the maintenance dredging by year since 1972.

Calendar Year	Maintenance Dredging (Million Cu Yards) Tulsa Dist	Little Rock Dist	Total	Annual Flow @ Van Buren, AR (Million Ac-Ft)
1972	1.7	2.4	4.1	14.1
1973	1.1	3.5	4.6	61.1
1974	3.7	3.6	7.3	44.4
1975	0.7	1.4	2.1	33.9
1976	0.5	1.9	2.4	14.3
1977	0.4	1.7	2.1	15.1
1978	0.2	1.2	1.4	16.6
1979	0.5	0.8	1.3	17.6
1980	0.3	0.6	0.9	11.6

All historical sediment data from the Tulsa District portion of the basin has been inserted on the WATSTORE data system via USGS Oklahoma District and this data is available for computer retrieval and statistical manipulation by different agencies. The sediment data for the Little Rock District portion of the basin have been stored on disc and tape on the Southwestern Division Computer. A computer program was written to store and retrieve data using a Tektronic 4014, 4954, and 4663. The program also allows for modification, update of new data, and comparison of different sediment surveys.

Additional highlights of the sedimentation program for the year are:

a. Suspended sediment samples are currently collected at 81 stations.

b. Resurvey report of the 1962 and 1969 Resurveys of Sedimentation for Denison Dam, Lake Texoma, has been submitted for preliminary approval.

c. Reservoir Sediment Data Summary (Eng. Form 1787) for Canton Lake giving the results of the 1976 resurvey of sedimentation was submitted to and approved by Southwestern Division.

d. Pole monuments have been installed on the following projects; Council Grove Lake, Ks., Lake Texoma, Tx., Eufaula, Keystone, Kaw, Hulah Lakes, Ok. These monuments will allow hydrographic resurveys during flood stages.

e. Original sediment surveys have been initiated on El Dorado Lake, Ks., Clayton, Skiatook and Copan Lakes, Ok.

f. 162 sediment ranges below Fort Smith were resurveyed during FY 80.

g. The 1980 sediment samples along the main stem below Fort Smith contained less sediment than samples taken during average flow years.

J. Special Operations. Several special operations were required during the year. These are summarized as follows:

a. Releases from Cheney Reservoir were closed off on 16 January through 25 January to clean out debris from outlet channel and stilling basin. During the period 13 - 17 April the releases were shut off to enable repairs to be made to a pipeline crossing the Ninnescah River near the Highway 54 bridge.

b. Releases from Canton Lake were shut off on 17 March through 21 March to allow for pipeline construction across the North Canadian River near Oklahoma City and remained shut off through 31 March at the request of the U.S.G.S. for a low flow study from Canton to Oklahoma City. On 1 April releases were made from Canton Lake for Oklahoma City water supply and continued through 18 April.

c. To provide water for sustained releases near regulating stages on the Petit Jean River for water surface profile surveys, Blue Mountain Lake inflows were stored between 23 March and 1 May 1980. During this operation, the pool reached elevation 390.00, 6 feet above the conservation pool, prior to beginning releases with a target for a sustained stage of 14 feet on the Danville gage. The sustained stages allowed Little Rock

District personnel time to stake the resultant water surface profile and inspect the downstream valley under conditions which generate flood complaints. The project was returned to the normal regulation criteria 1 May 1980. A study of current and alternative regulation procedures for this project is currently underway.

d. In april 1980 a joint effort by SWPA, Tulsa District, and Little Rock District was utilized to stop the Arkansas River flows at L&D No. 13 for 4 hours to facilitate search and recovery efforts related to a drowning in the Lock and Dam 13 stilling basin.

e. Tulsa and Little Rock Districts cooperated on a special request from the Junior League of Fort Smith to hold the flows at Van Buren to 20,000 cfs on 10 and 11 May 1980 for annual canoe, sailboat, and bass-boat races.

f. Releases were reduced at Kaw Lake on 11 June through 13 June to allow OG&E to install a temperature monitor downstream of the dam.

g. Pool elevation at Webbers Falls was held above elevation 490.0 from mid-June to mid-August because of the shoaling problem at the mouth of the Verdigris River. The three power units at Webbers Falls Lock and Dam were taken out of service from 26 June through the end of the year due to cracked shafts

h. Special releases were made at Great Salt Plains from mid-July through the end of the year to eliminate fish kills and for pollution abatement.

i. Due to severe drought conditions, low flow releases from Elk City, Fall River and Toronto were reduced in mid-August at the request of the Kansas Water Resources Board to prolong water quality releases. Low flow releasea at Toronto were further reduced in September and December again at the request of the Kansas Water Resources Board to prolong water quality releases.

j. Special releases were made from John Redmond Lake on 2 September at the request of the Kansas Fish and Wildlife Service through the Kansas Water Resources Board to improve water quality in the river below the dam. In late October special releases were made to enable KG&E to start continuous pumping into their Wolf Creek cooling lake.

k. Special releases were made at Keystone, Robert S. Kerr, and W.D. Mayo in September to provide flows for the annual raft races at Tulsa and Fort Smith.

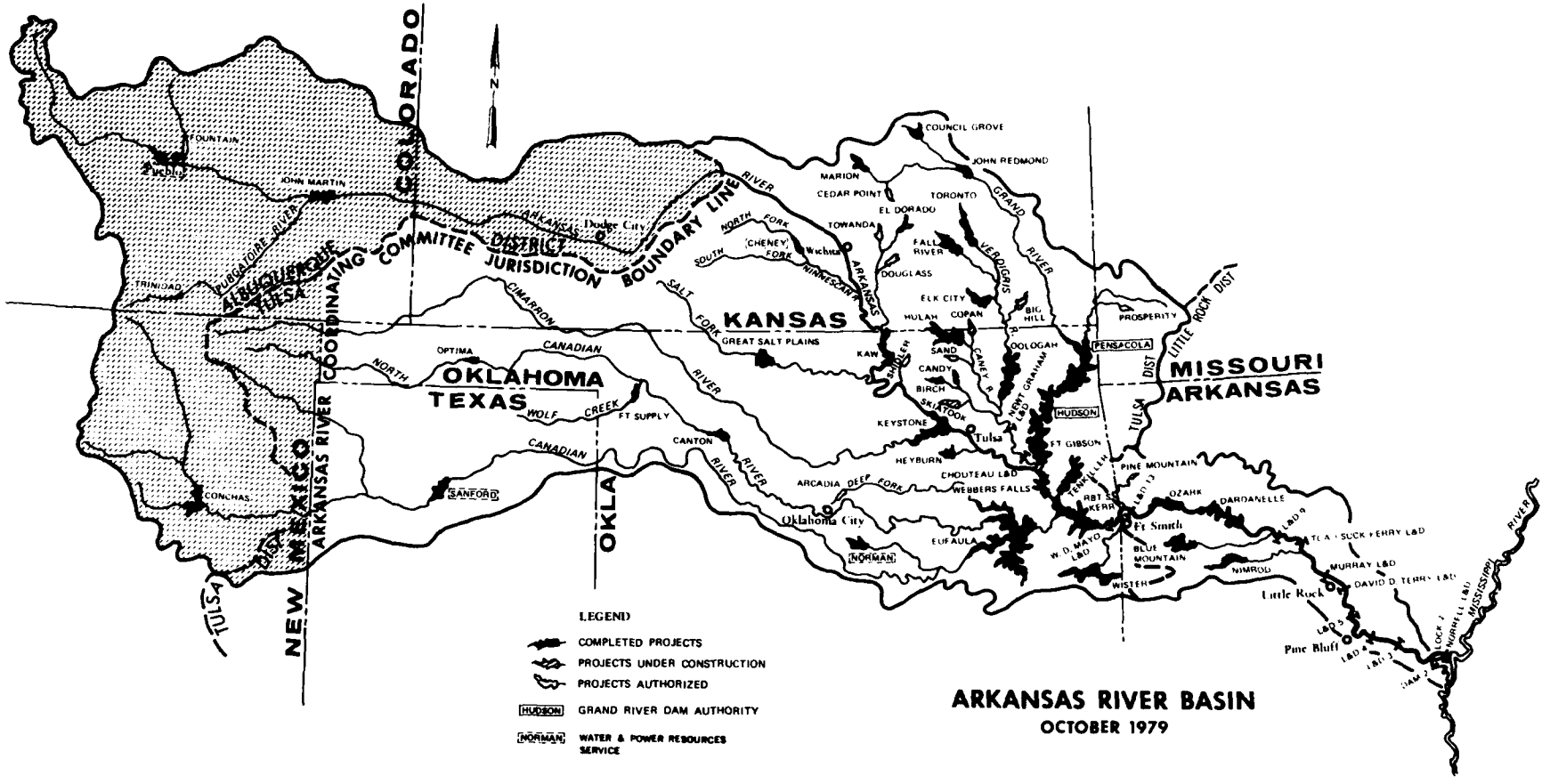
l. Special releases were made from Heyburn Lake at the request of the Creek County Rural Water District for irrigation downstream of the dam.

m. Arkansas River. On the Arkansas River below Fort Smith, Arkansas, several of the pools were raised for short periods during the year to maintain navigation depths over isolated shoals while dredging operations were performed. Two of the pools (#2 and #5) were also raised to furnish irrigation water during the growing season. All the pools have been returned to normal levels.

n. There were several short-term release stoppages through the year to allow for searches for drowning victims.

V. Plans for 1981

No changes to the System Regulation Plan used in 1980 are planned for 1981.



ARKANSAS RIVER BASIN

OCTOBER 1979

PLATE 1

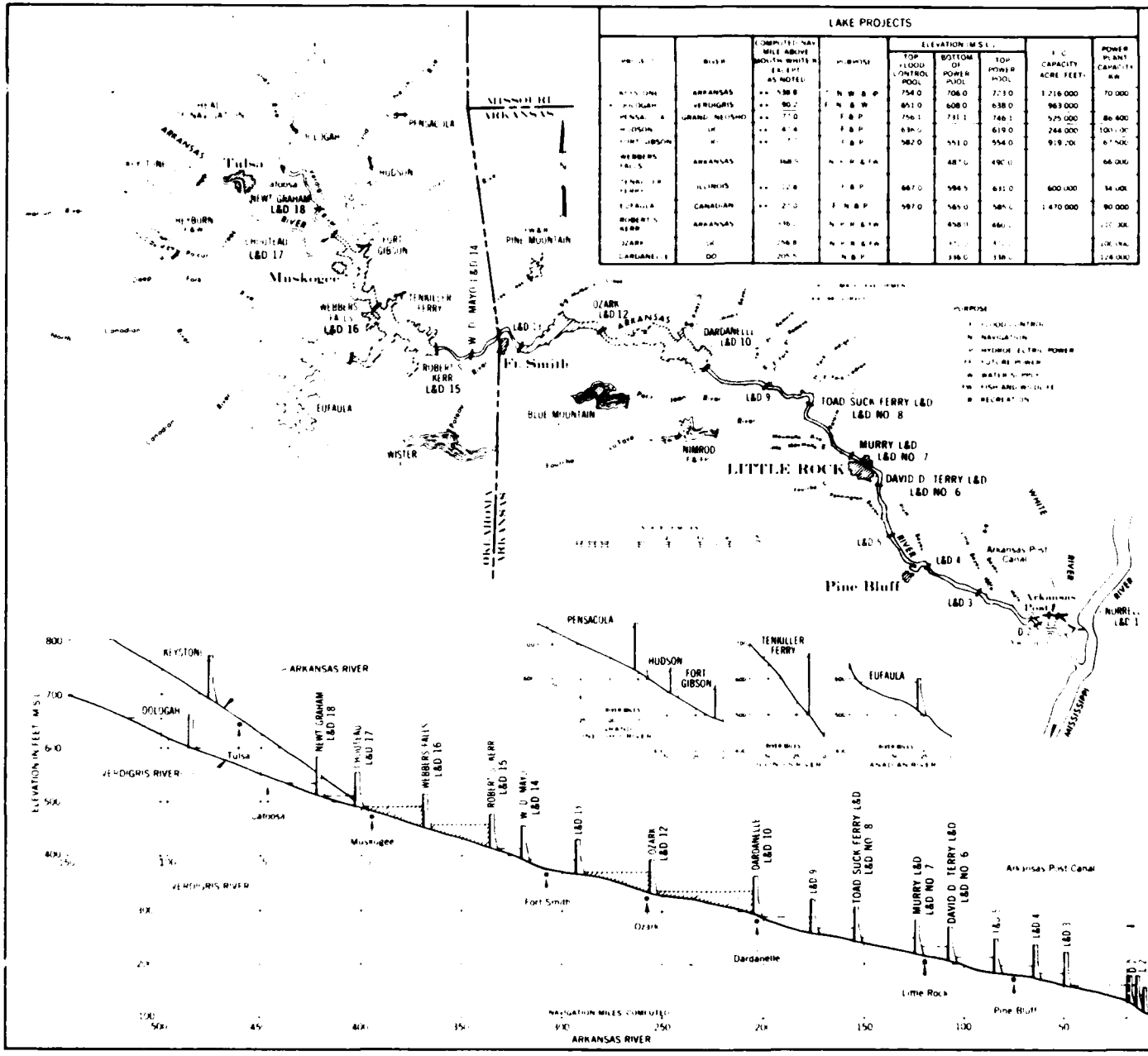
ANNUAL MAXIMUM AND MINIMUM POOL ELEVATIONS
ARKANSAS RIVER BASIN PROJECTS BELOW GREAT BEND KANSAS

PROJECT	STREAM	YEAR IN OPERATION	CONSERVATION		FLOOD CONTROL		1980 POOL ELEVATIONS			
				STORAGE		STORAGE	MAXIMUM		MINIMUM	
			POOL ELEV	AC-FT	POOL ELEV	AC-FT	ELEV	DATE	ELEV	DATE
Cheney 1/	N. F. Ninnescah	1964	1421.6	151,800	1429.0	80,860	1423.78	4 Apr	1419.09	2 Dec
Great Salt Plains	Salt Fork Ark	1941	1125.0	0	1138.5	242,700	1127.76	24 Jun	1123.32	16 Nov
Kaw	Arkansas R.	1976	1010.0	343,500	1044.5	919,400	1020.28	5 Apr	1009.52	6 Mar
Keystone	Arkansas R.	1964	723.0	351,000	754.0	1,216,000	732.65	23 Jun	716.80	16 Oct
Heyburn	Polecat Cr.	1950	761.5	4,400	784.0	49,100	764.59	18 Jun	758.64	30 Dec
Toronto	Verdigris R.	1960	901.5	10,700	931.0	172,000	916.73	1 Apr	897.05	4 Dec
Fall River	Fall R.	1949	948.5	15,700	987.5	235,100	958.91	1 Apr	943.59	1 Dec
Elk City	Elk R.	1966	796.0	44,800	825.0	239,500	801.26	1 Apr	791.86	24 Dec
Oologah	Verdigris R.	1963	638.0	544,100	661.0	965,600	642.31	4 Apr	635.01	4 Dec
Hulah	Caney R.	1950	733.0	33,400	765.0	257,800	741.45	1 Apr	727.97	31 Dec
Birch	Birch Cr.	1977	750.5	15,840	774.0	39,000	754.29	28 Apr	747.76	31 Dec
Council Grove	Neosho R.	1964	1274.0	48,500	1289.0	63,800	1279.75	4 Apr	1267.39	6 Dec
Marion	Cottonwood R.	1968	1350.5	85,860	1358.5	59,900	1353.35	4 Apr	1347.15	4 Dec
John Redmond	Neosho R.	1964	1039.0	77,300	1068.0	559,000	1055.38	4 Apr	1036.80	3 Dec
Pensacola 1/	Neosho R.	1940	745.0	586,000	755.0	525,000	744.44	20 Apr	734.0	14 Oct
Lake Hudson 1/	Neosho R.	1964	61[illegible].0	0	636.0	244,000	620.37	30 Mar	618.26	27 Apr
Fort Gibson	Neosho R.	1952	554.0	53,900	582.0	919,200	556.80	1 Apr	552.46	5 Feb
Webbers Falls	Arkansas R.	1970	490.0	30,000	-	0	490.61	7 Aug	487.33	6 Mar
Tenkiller Ferry	Illinois R.	1951	632.0	371,000	667.0	576,700	632.87	26 May	620.92	14 Nov
Conchas	Canadian R.	1939	4201.0	273,000	4218.0	198,300	4181.47	14 Jun	4167.51	23 Dec
Sanford 1/	Canadian R.	1965	2941.3	866,300	2965.0	462,100	2889.38	26 Feb	2880.30	31 Dec
Norman 1/	Little R. (Ark)	1965	1039.0	105,900	1049.4	76,600	1040.97	1 Jun	1035.37	6 Dec
Optima 2/	N. Canadian R.	1978	2763.5	117,650	2779.0	100,500	2722.90	31 May	2719.5	24 Nov
Fort Supply	Wolf Cr.	1941	2004.0	400	2028.0	87,200	2005.89	28 Apr	2001.85	27 Oct
Canton	N. Canadian R.	1948	1615.2	97,700	1638.0	267,600	1618.09	2 Jun	1608.08	4 Dec
Eufaula	Canadian R.	1964	585.0	1,481,000	597.0	1,470,000	586.44	29 Jun	578.63	6 Dec
Robert S. Kerr	Arkansas R.	1970	460.0	79,500	-	0	460.74	19 Jun	458.05	29 Mar
Wister	Poteau R.	1949	471.6	30,000	502.5	400,000	478.88	5 May	471.40	1 Feb
Ozark	Arkansas R.	1969	372.0	19,400	-	0	372.8	21 Aug	370.1	30 Aug
Dardanelle	Arkansas R.	1964	338.0	65,000	-	0	338.4	22 Jun	336.0	16 Apr
Blue Mountain	Petit Jean	1947	384.0	0	419.0	233,000	393.3	23 May	384.0	22 Feb
Nimrod	Fourche La Fave R.	1942	342.0	0	373.0	307,000	351.0	17 May	342.0	29 Feb

1/ Non-Corps project under Sec 7 of 1944 F/C Act
2/ Non-significant rise in pool since closure on 2 Oct 78

CORPS OF ENGINEERS

U S ARMY



LAKE PROJECTS

PROJECT	RIVER	COMPUTED NAV MILE ABOVE MOUTH OF WHITE R EXCEPT AS NOTED	PURPOSE	ELEVATION (M S L) TOP FLOOD CONTROL POOL	BOTTOM OF POWER POOL	TOP POWER POOL	G C CAPACITY ACRE FEET	POWER PLANT CAPACITY KW
BEAVER	WHITE	** 530 8	F N W & P	754 0	708 0	723 0	1 216 000	70 000
[illegible]	VERDIGRIS	** 90 2	F N & W	651 0	608 0	638 0	963 000	
[illegible]	GRAND (NEOSHO)	** 77 0	F & P	756 1	731 1	746 1	525 000	86 400
[illegible]	[illegible]	** 4 4	F & P	639 0		619 0	244 000	100 000
[illegible]	[illegible]	** 7 [illegible]	F & P	582 0		551 0	554 0	919 200	67 500
ROBERTS FALLS	ARKANSAS	368 9	N W W & PA			487 0	490 0		66 000
TENKILLER FERRY	ILLINOIS	** 22 8	F & P	667 0		594 5	631 0	600 000	34 000
EUFAULA	CANADIAN	** 27 0	F N & P	597 0		565 0	584 0	1 470 000	90 000
ROBERTS KERR	ARKANSAS	336 2	N W W & PA			456 0	466 0		127 200
OZARK	AR	256 8	N W W & PA			[illegible]	[illegible]		100 000
CARDANELLE	DO	205 5	N & P			336 0	338 0		124 000

PURPOSE
F FLOOD CONTROL
N NAVIGATION
P HYDROELECTRIC POWER
R RURAL WATER SUPPLY
W WATER SUPPLY
FW FISH AND WILDLIFE
R RECREATION

NAVIGATION PROJECTS
River and Harbor

STRUCTURE	NAVIGATION MILE (COMPUTED)		UPPER POOL ELEVATION (FEET M S L)	LOWER POOL ELEVATION (FEET M S L)
NEWT GRAHAM L&D (18)	26 7	VERDIGRIS R	532 0	511 0
CHOUTEAU DAM (17)	(2) 9 6	DO	511 0	490 0
CHOUTEAU LOCK (17)	6 5	DO	511 0	490 0
ROBERTS FALLS L&D (16) (1)	368 9	ARKANSAS R	490 0	480 0
ROBERT S KERR L&D (15) (1)	336 2	DO	480 0	432 0
W D MAYO L&D (14)	319 6	DO	412 0	392 0
L&D NO 13 (4)	282 8	DO	392 0	372 0
OZARK L&D (12) (1)	256 8	DO	372 0	338 0
L&D NO 11	DELETED			
DARDANELLE L&D (10) (1)	205 5	DO	338 0	304 0 287 0
L&D NO 9 (5)	176 9	DO	304 0 287 0	265 0
TOAD SUCK FERRY L&D (8)	155 9	DO	265 0	248 0
MURRAY L&D 7)	125 4	DO	248 0	231 0
DAVID D TERRY L&D (6)	108 1	DO	231 0	213 0
L&D NO 5	88 3	DO	213 0	196 0
L&D NO 4	66 0	DO	196 0	182 0
L&D NO 3	50 2	DO	182 0	162 0
DAM NO 2	40 5	DO	162 0	ARKANSAS R
LOCK NO 2	13 3		162 0	142 0
NORRELL L&D (1)	10 1		142 0	112 (WHITE R)

(1) MULTIPLE PURPOSE
(2) 21 MILES ABOVE MOUTH OF VERDIGRIS RIVER
(3) LOCATED ON ARKANSAS RIVER 2 2 MILES BELOW CONFLUENCE AND END OF ARKANSAS POST CANAL
(4) ON ARKANSAS RIVER CHANNEL - 0 2 MILE DOWNSTREAM
(5) IN JUNCTION WITH NAVIGATION CHANNEL
(a) POWER STORAGE
(b) REREGULATION POOL

LEGEND

- Canalization approved
- Navigation lock & dam
- Navigation Power lake
- Lake included in multiple purpose plan
- Lake in operation (not included in multiple purpose plan)
- Lake approved (not included in multiple purpose plan)

ARKANSAS RIVER AND TRIBUTARIES
ARKANSAS AND OKLAHOMA

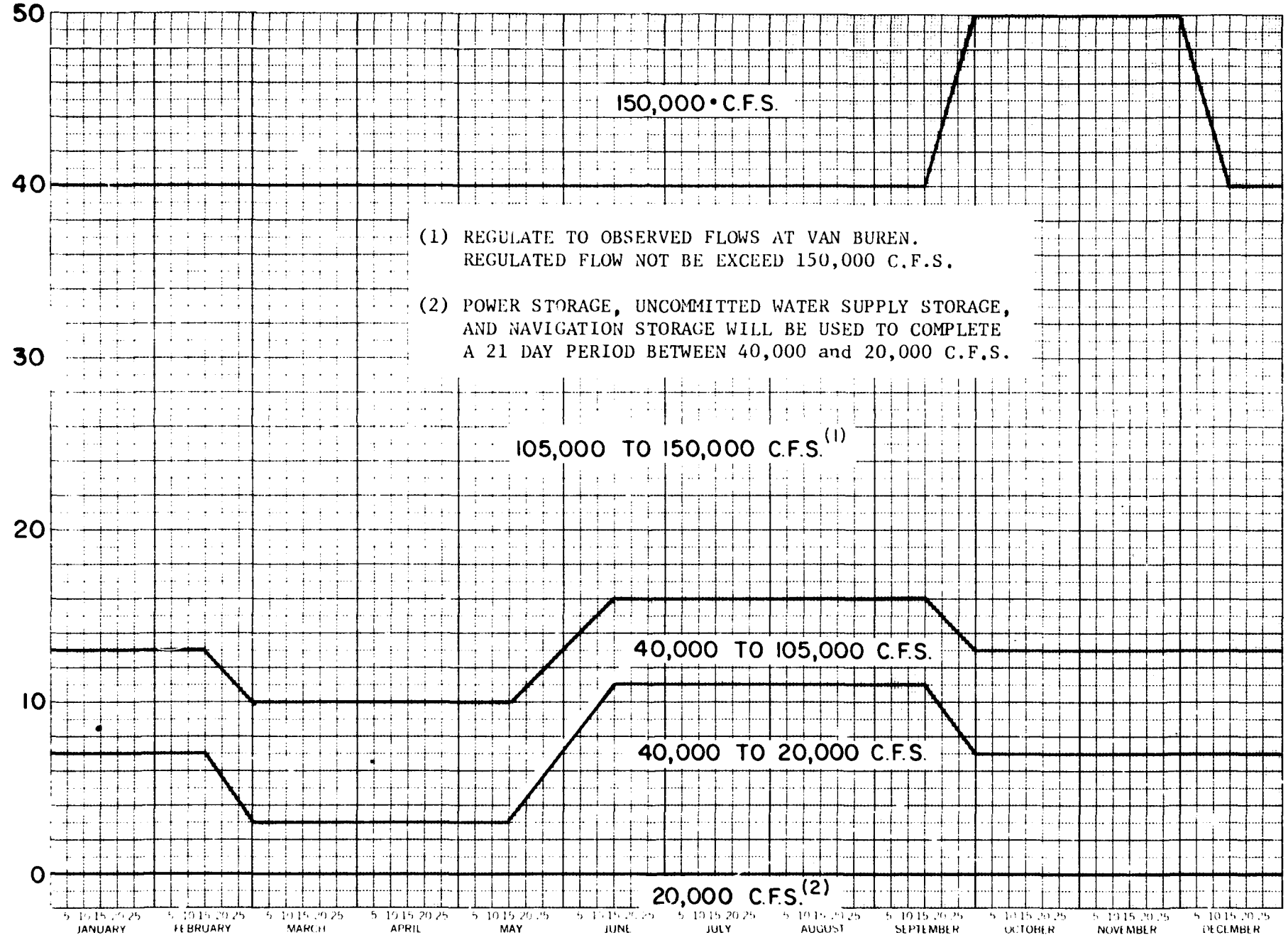
NAVIGATION FEATURES
GENERAL PLAN AND PROFILE

SCALE AS SHOWN

LITTLE ROCK DISTRICT CORPS OF ENGINEERS
LITTLE ROCK, ARKANSAS, SEPTEMBER 1974

DRAWN GAH
TRACED GRH
CHECKED OLH

PLATE 3



VAN BUREN GUIDE CURVE

Plate 4

ANNUAL RECORDED FLOW

ARKANSAS RIVER AT DAM No. 13, NEAR VAN BUREN, ARKANSAS

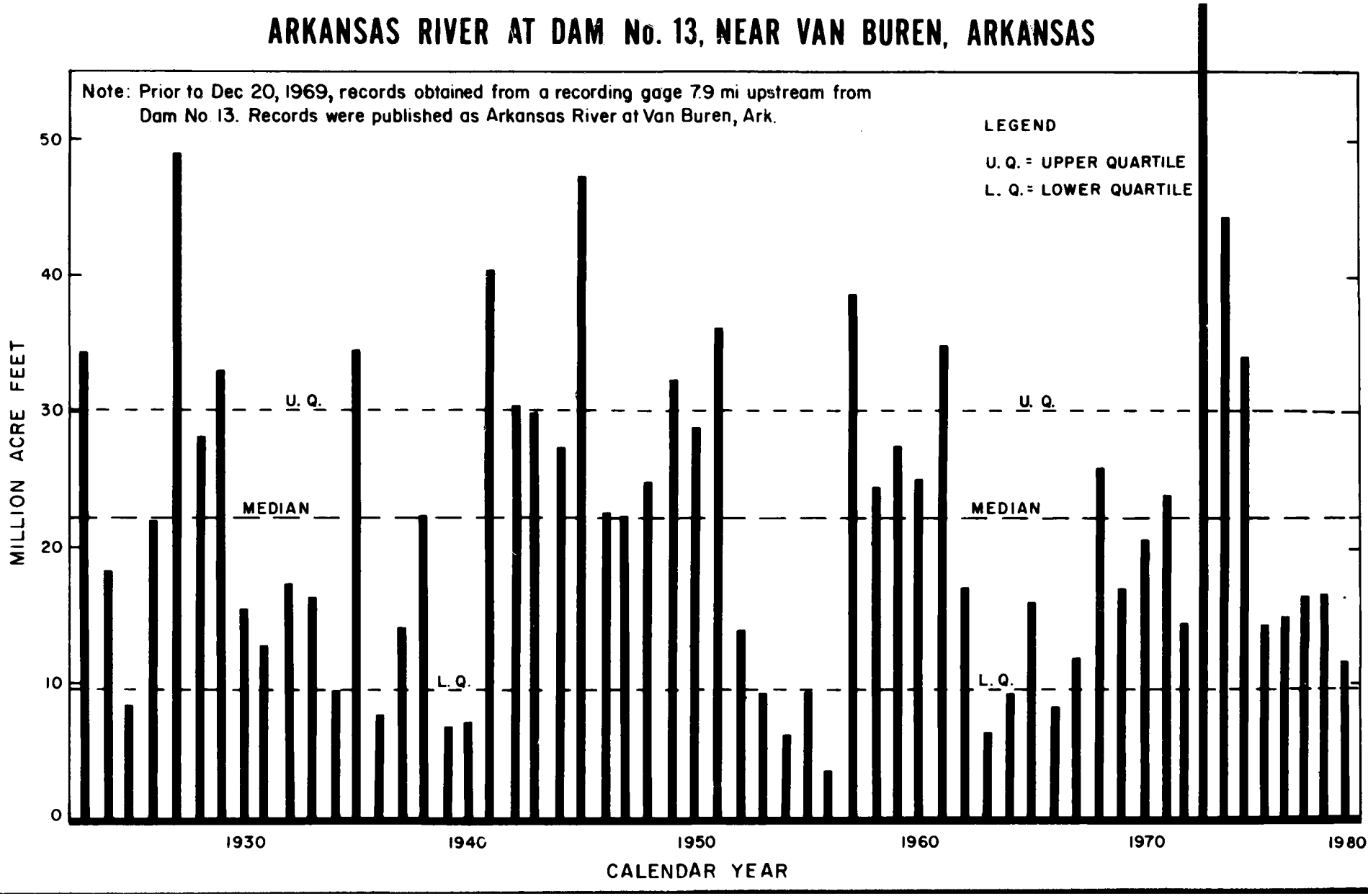
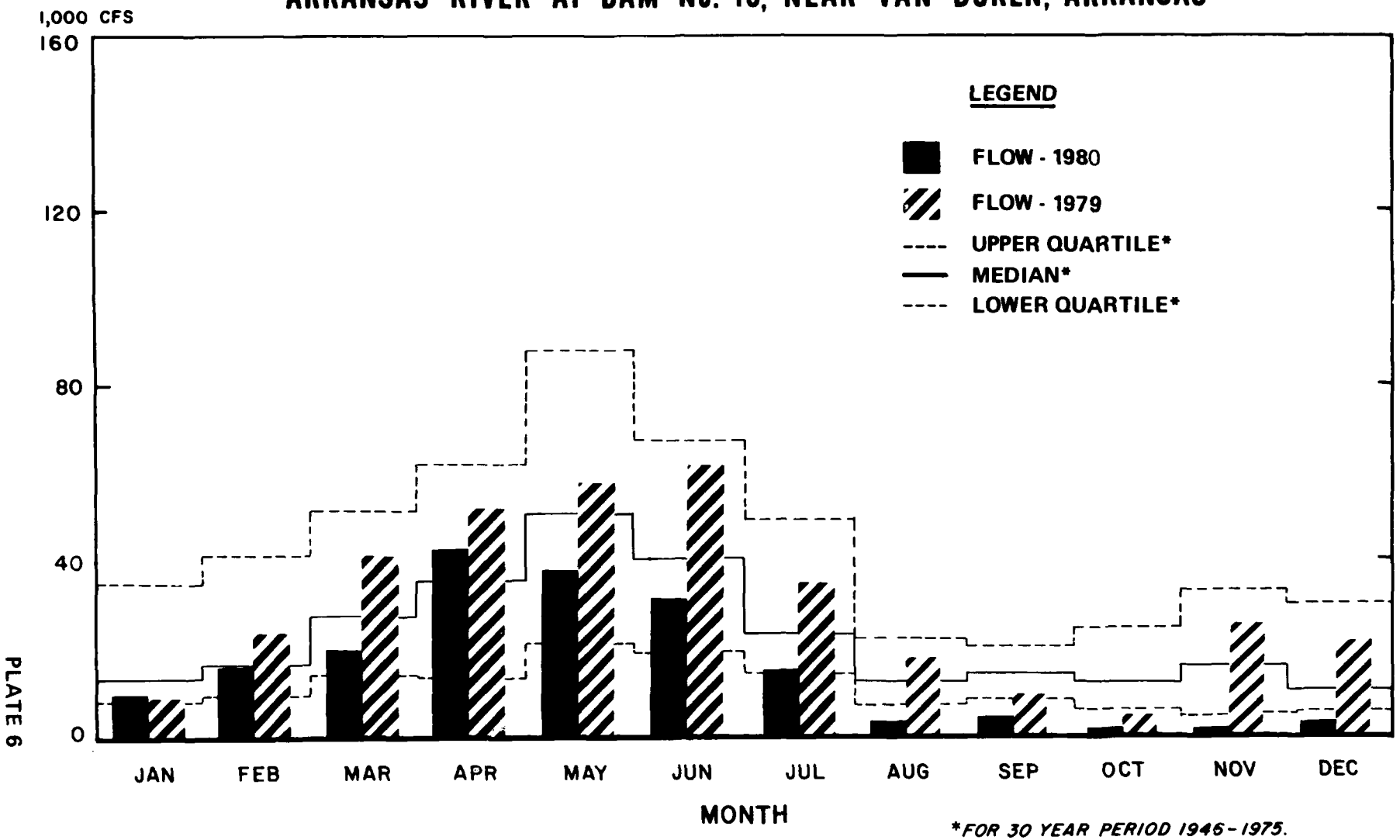


PLATE 5

AVERAGE MONTHLY RECORDED FLOWS

ARKANSAS RIVER AT DAM No. 13, NEAR VAN BUREN, ARKANSAS



*FOR 30 YEAR PERIOD 1946-1975.

PLATE 6

LOCK & DAM No. 13 - OUTFLOW HYDROGRAPH

1980

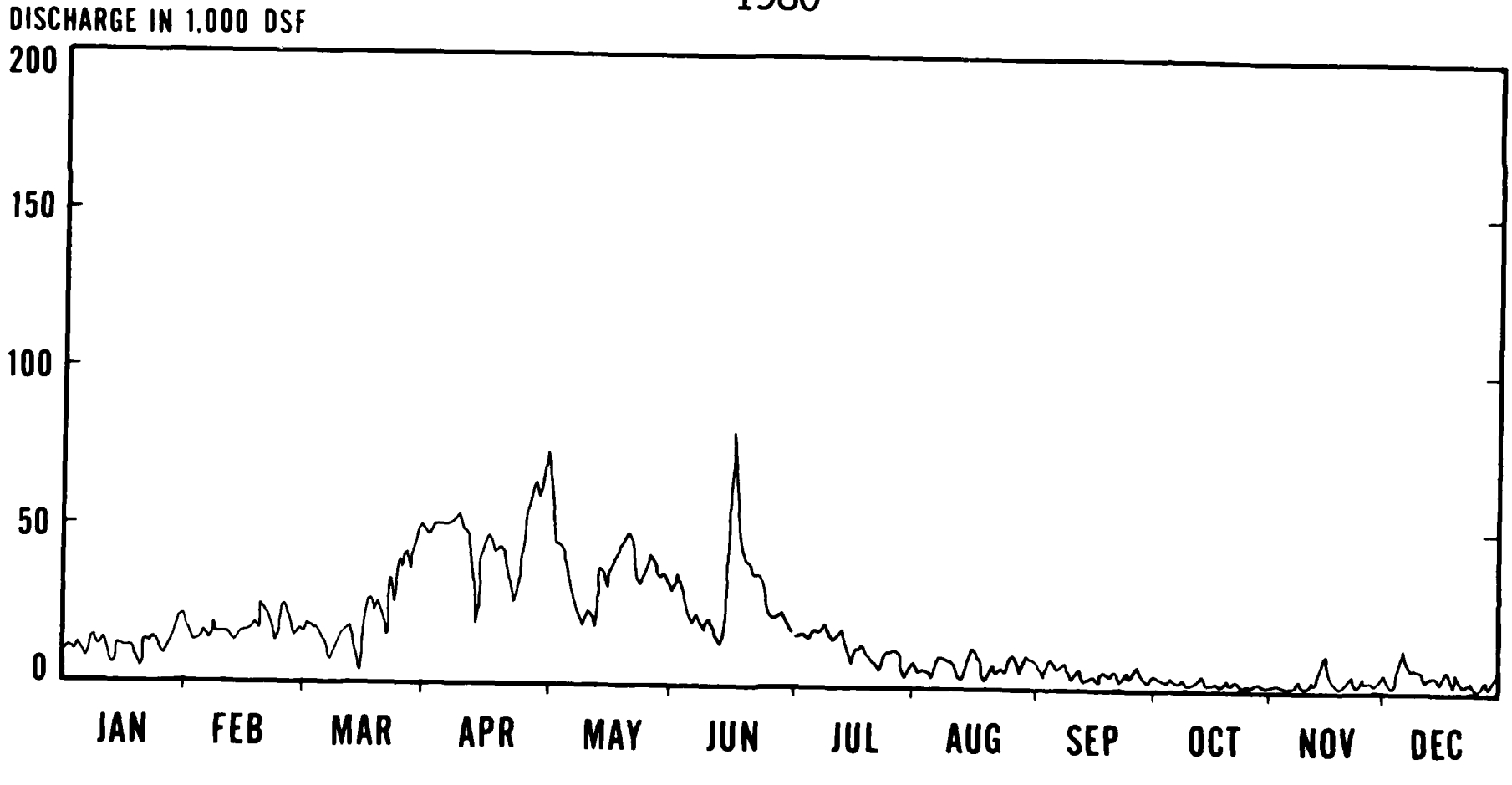


PLATE 7

KAW LAKE

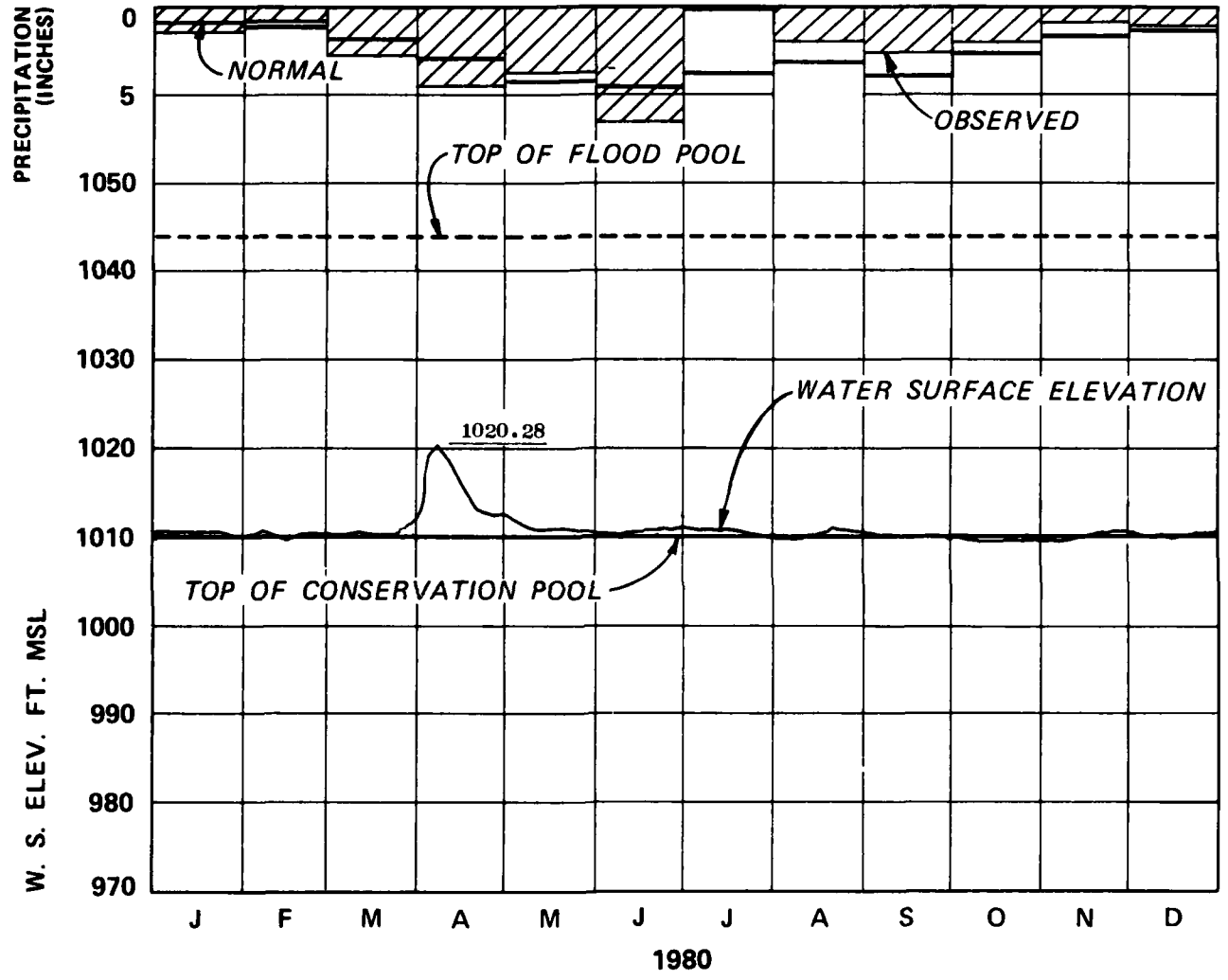
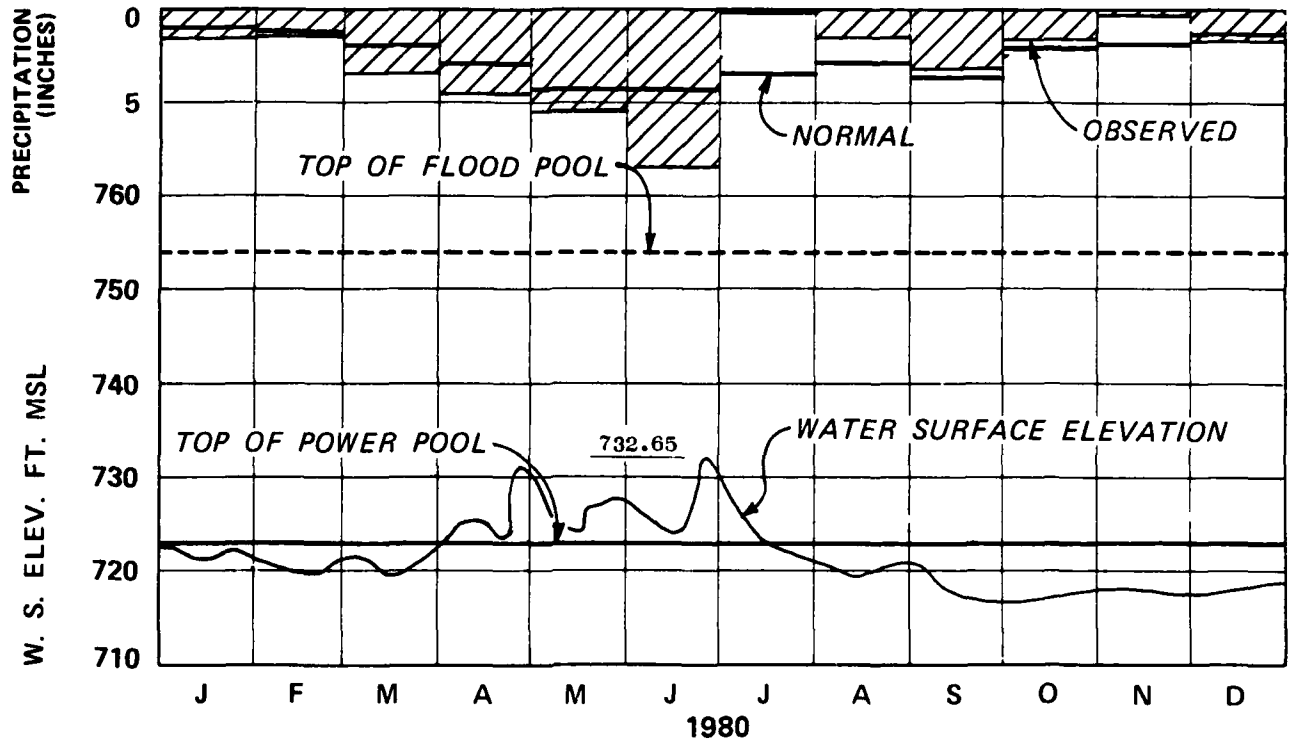


PLATE 8

KEYSTONE LAKE



FALL RIVER LAKE

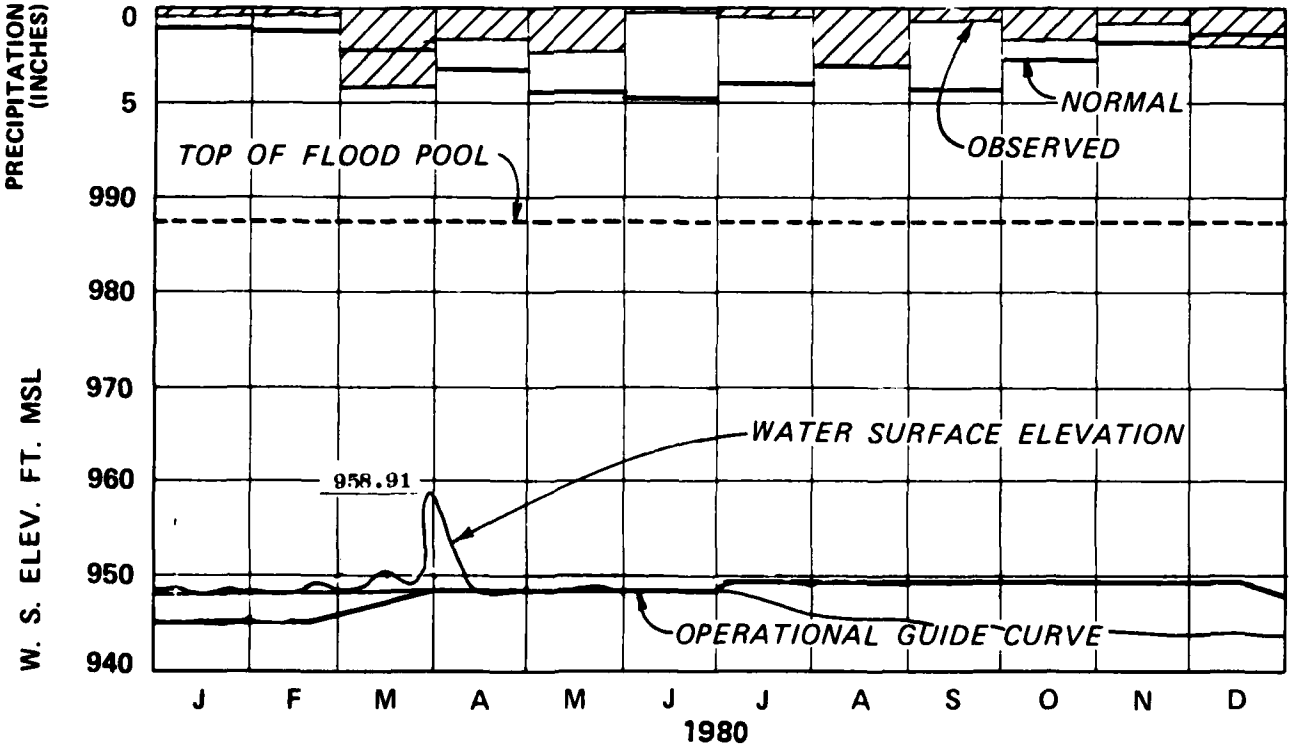
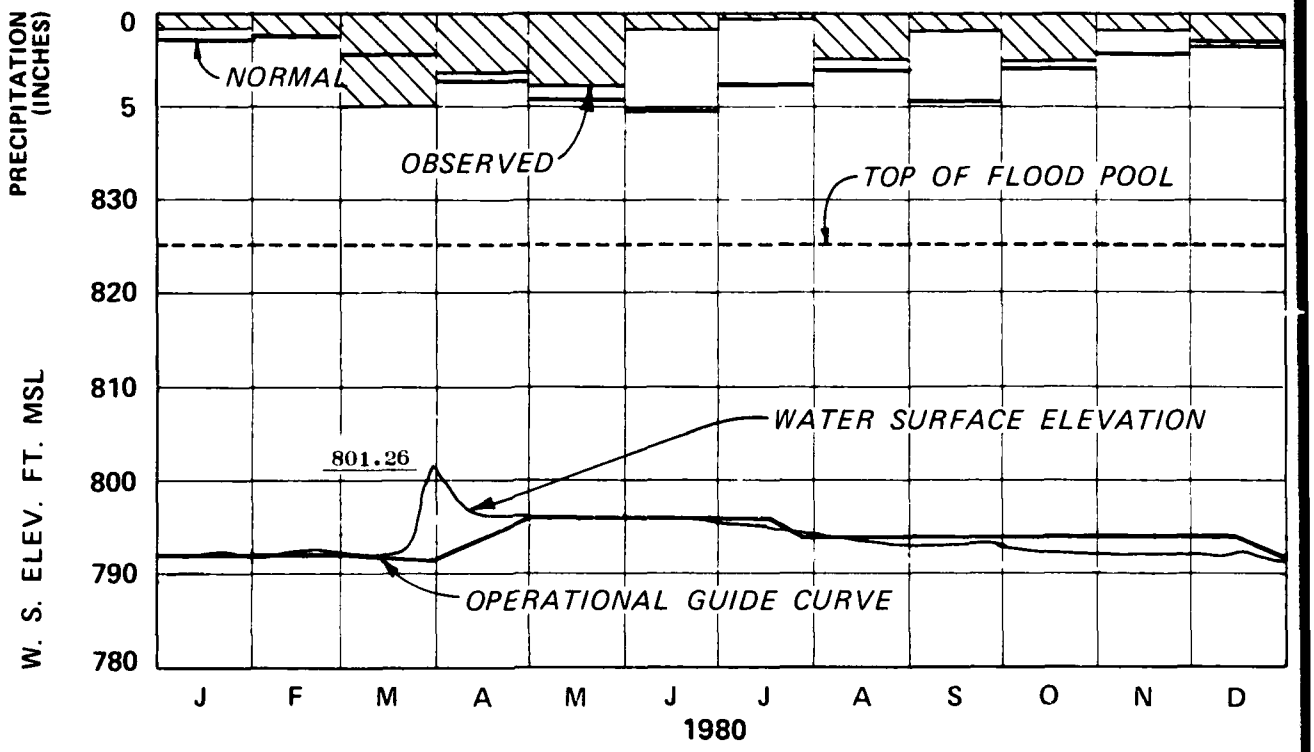


PLATE 9

ELK CITY LAKE



OOLOGAH LAKE

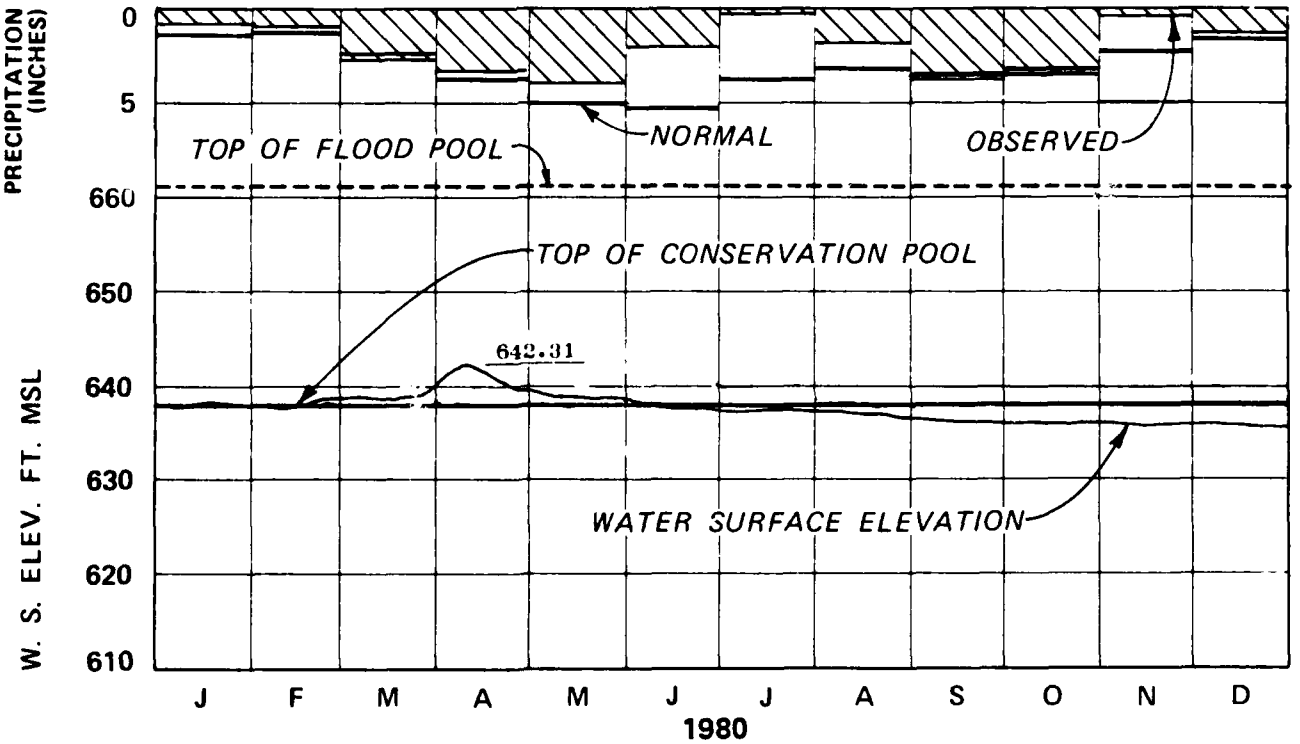
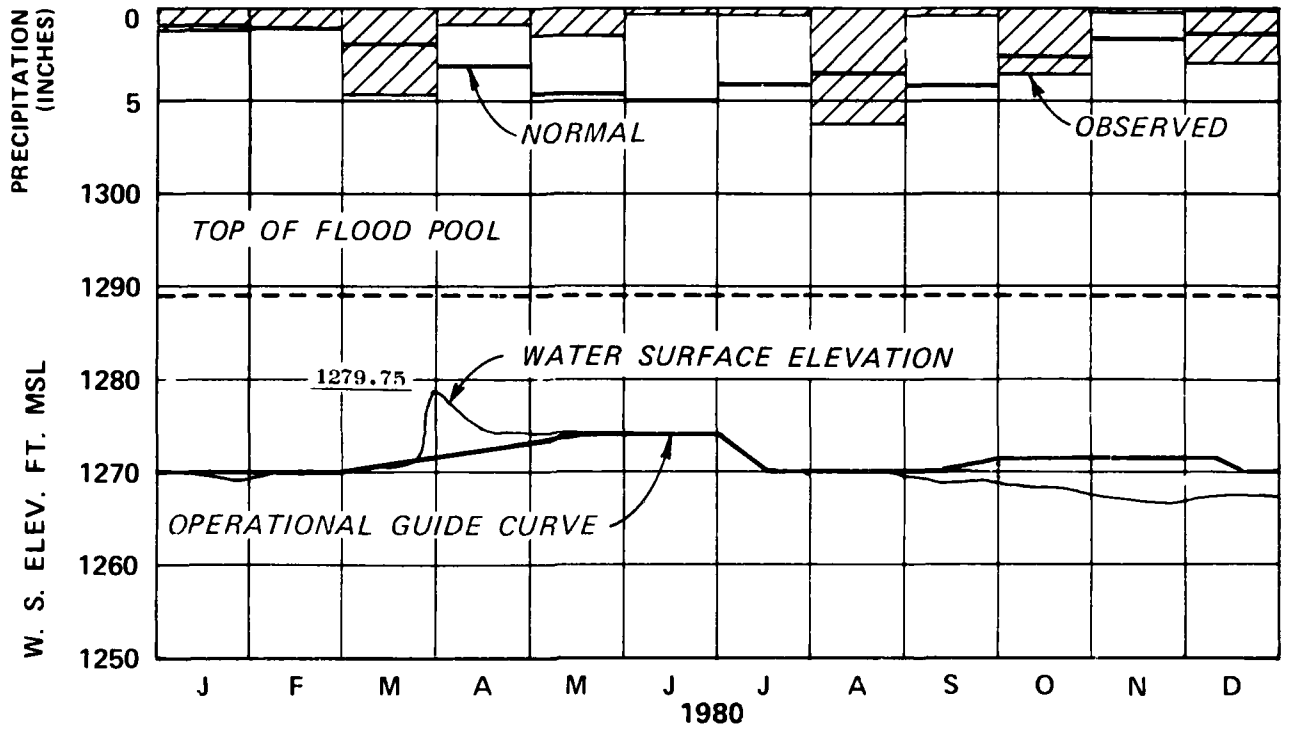


PLATE 10

COUNCIL GROVE LAKE



JOHN REDMOND RESERVOIR

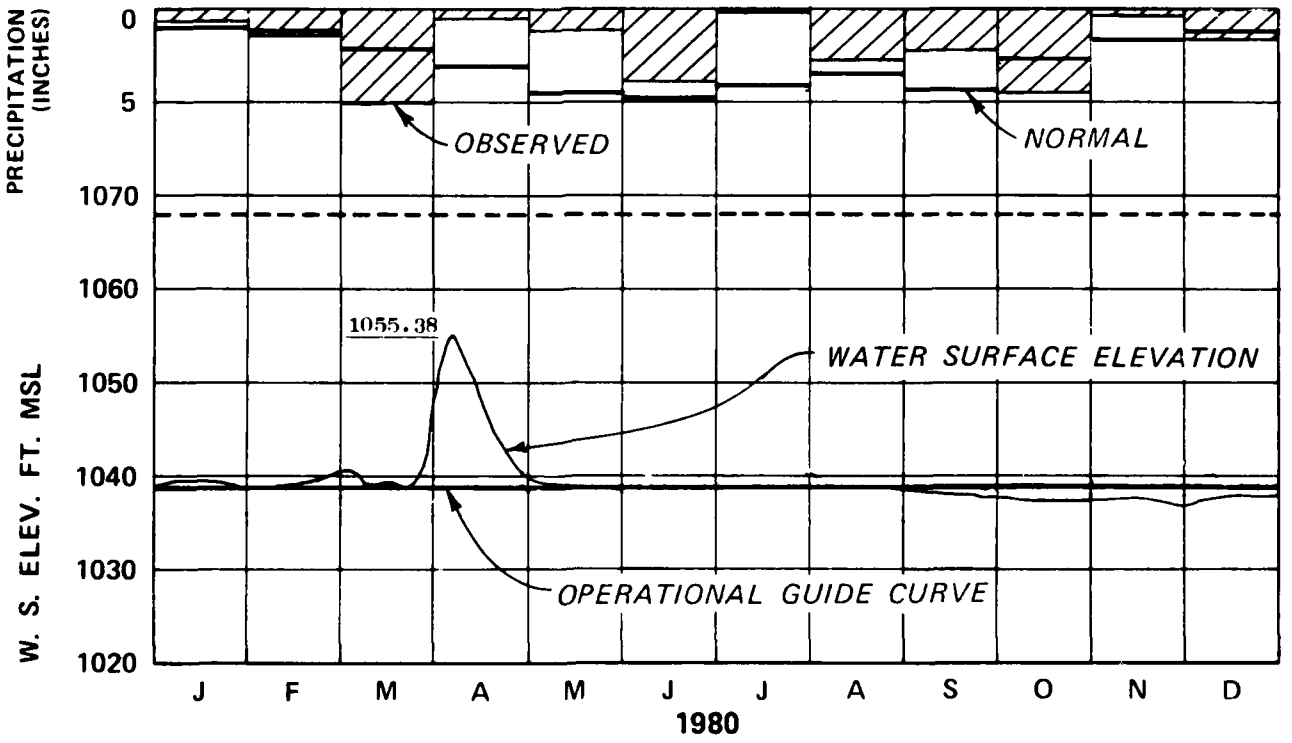
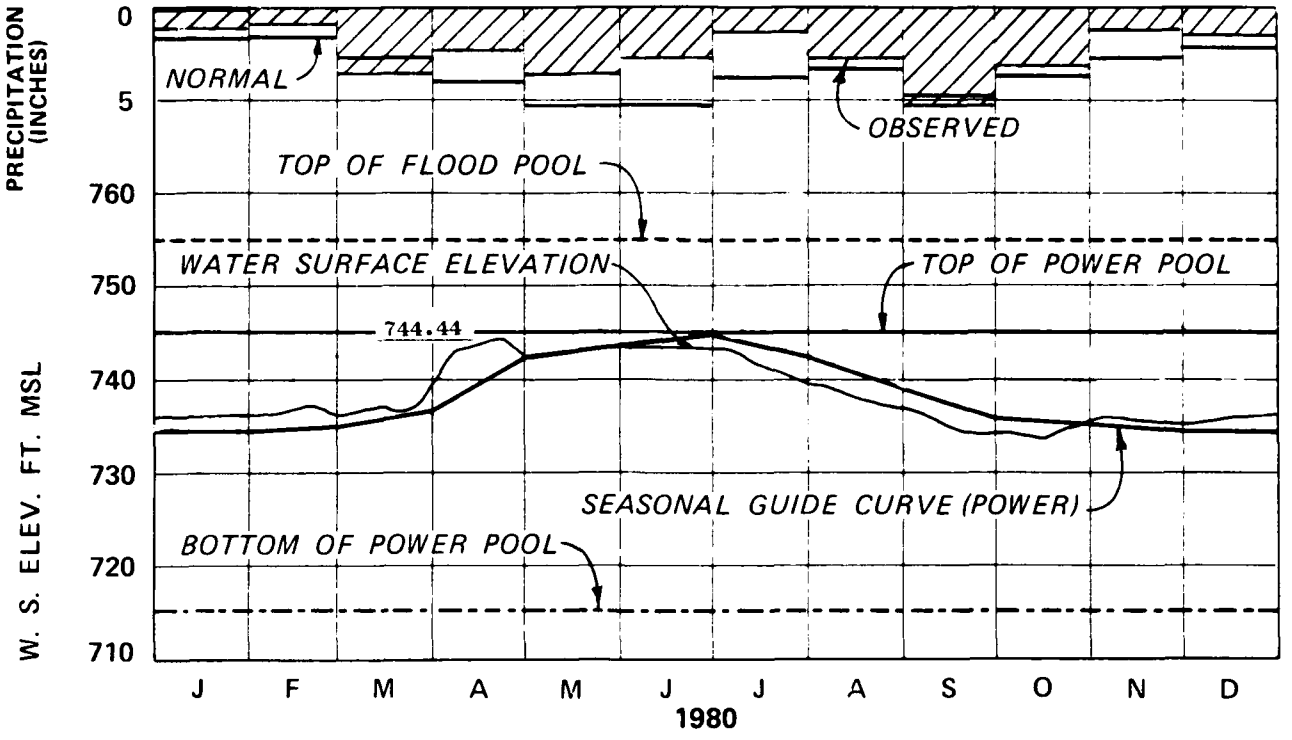


PLATE 11

GRAND LAKE (PENSACOLA) RESERVOIR



FT GIBSON LAKE

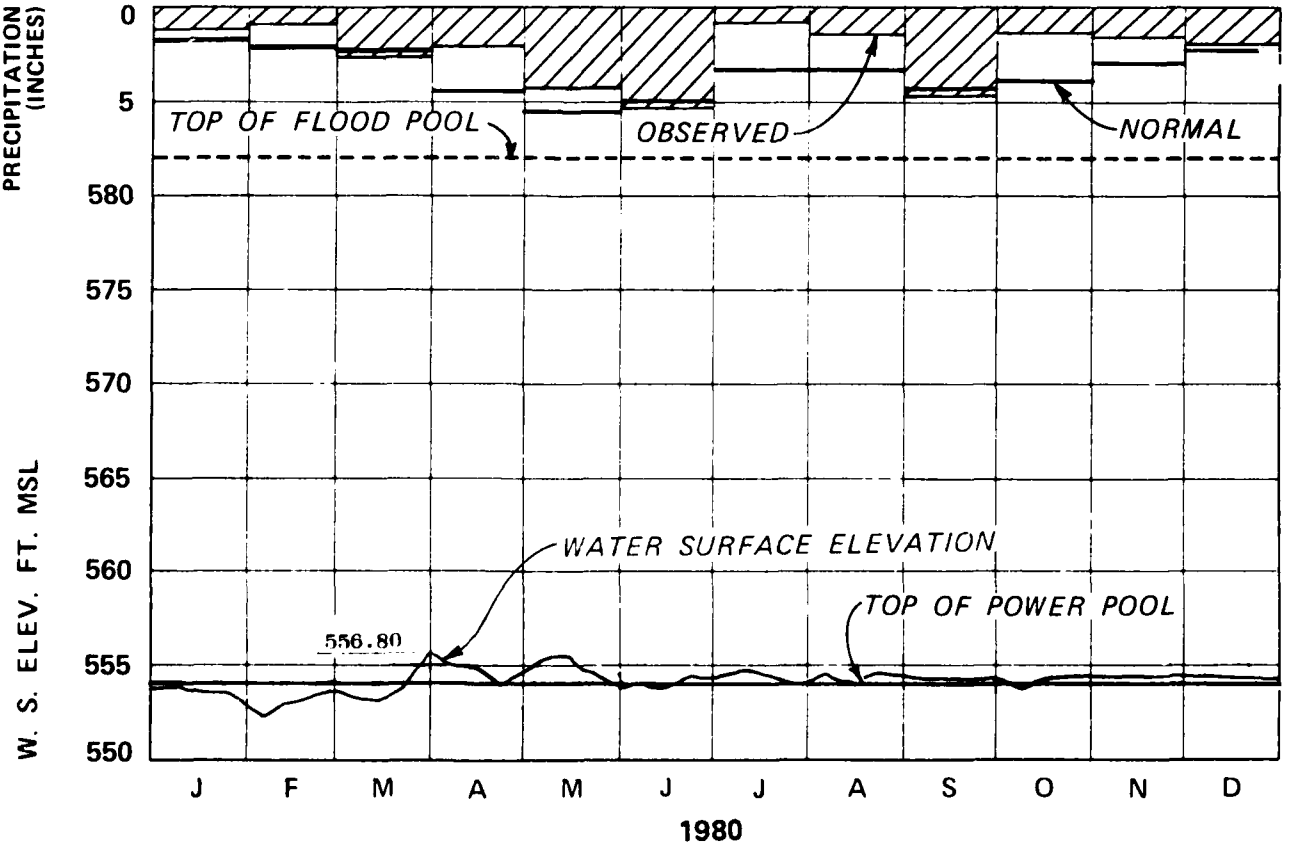


PLATE 12

TENKILLER LAKE

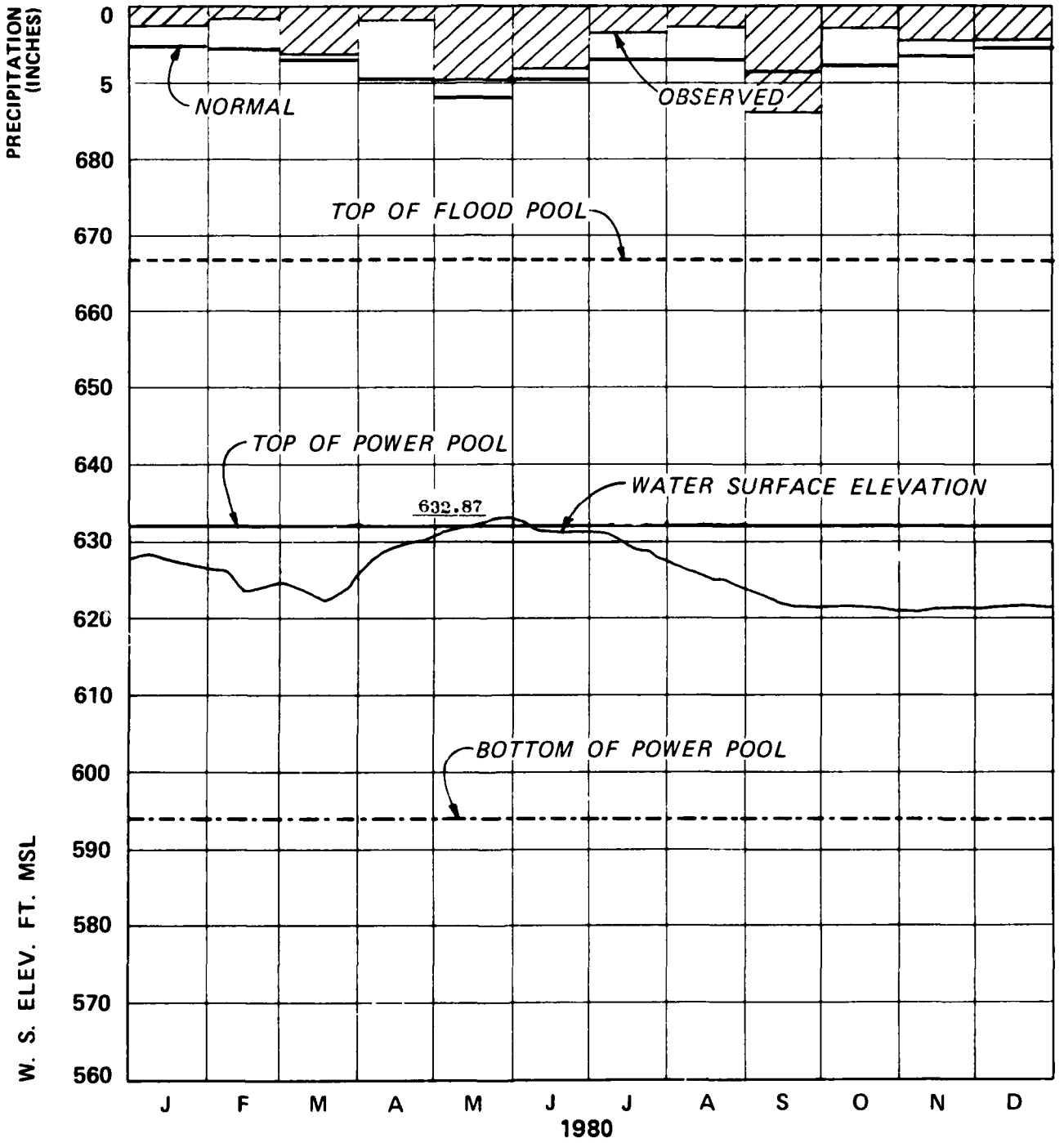
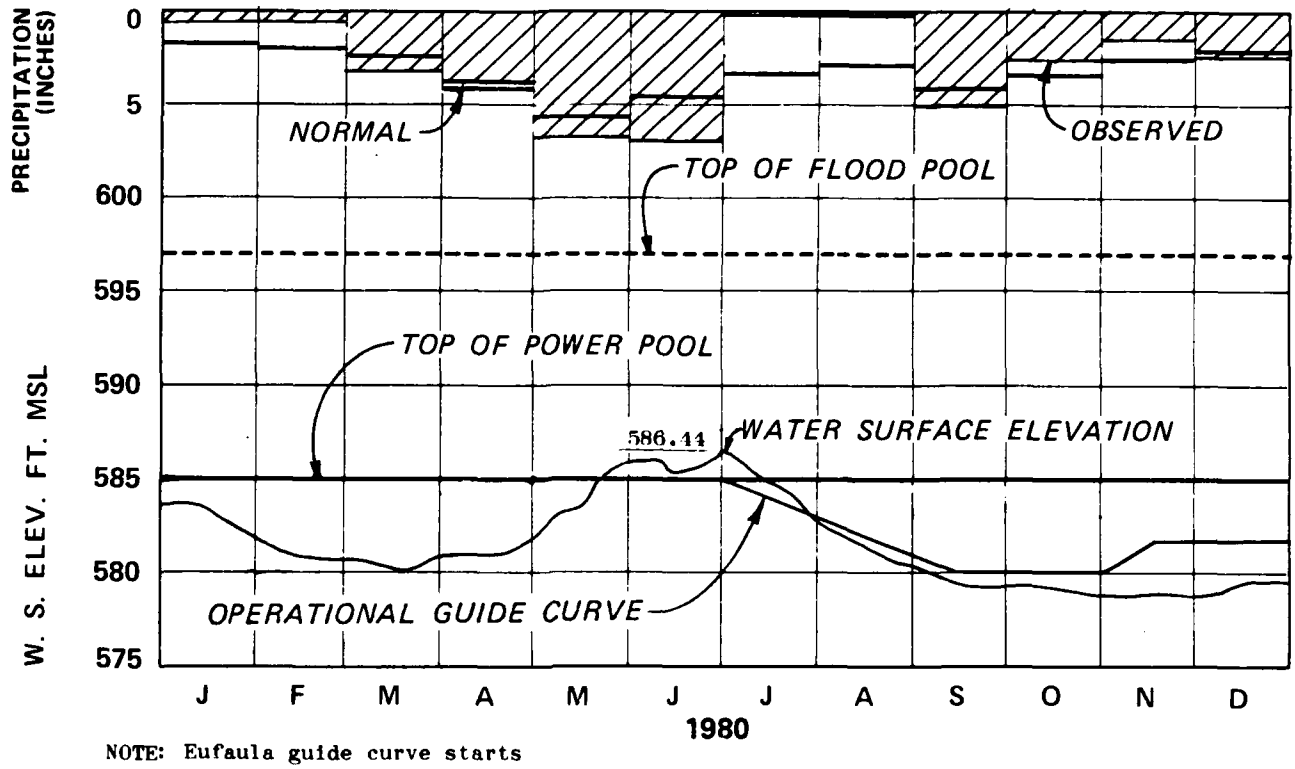


PLATE 13

EUFAULA LAKE



NOTE: Eufaula guide curve starts
1 July 1980 thru 1 July 1981
for 1 year

WISTER LAKE

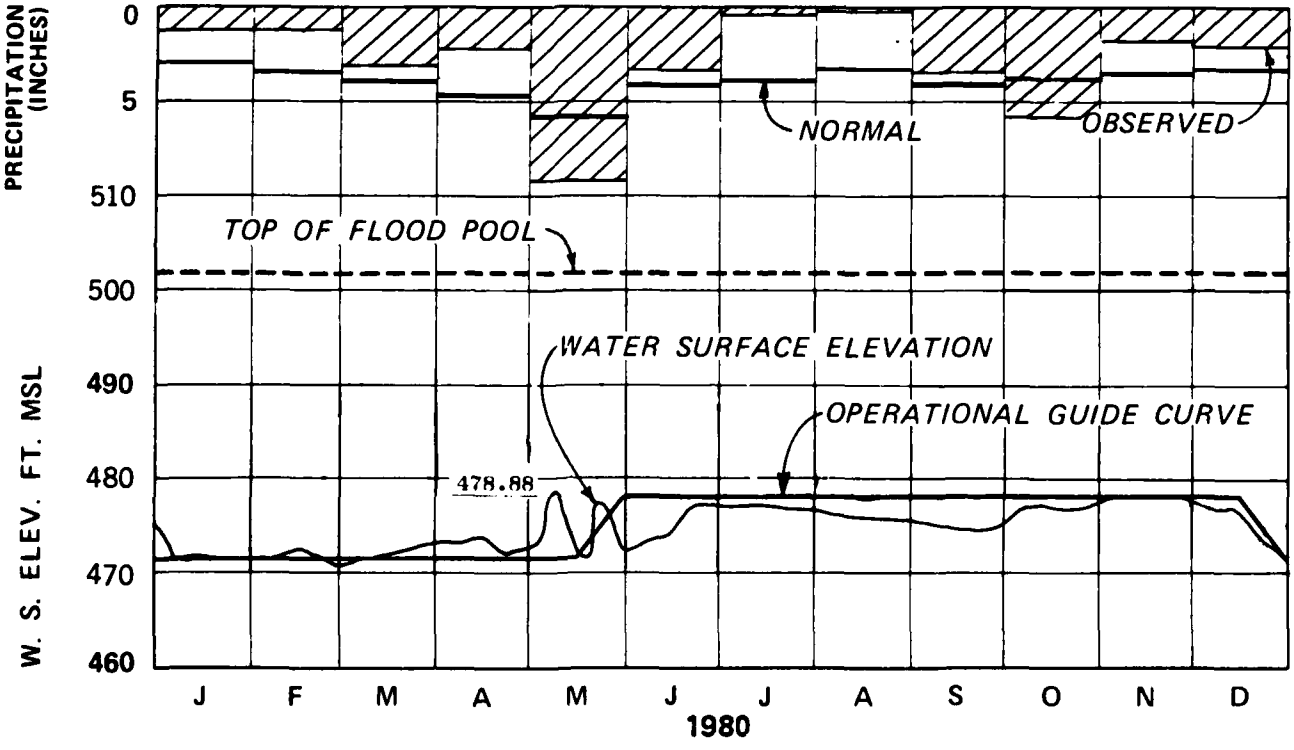
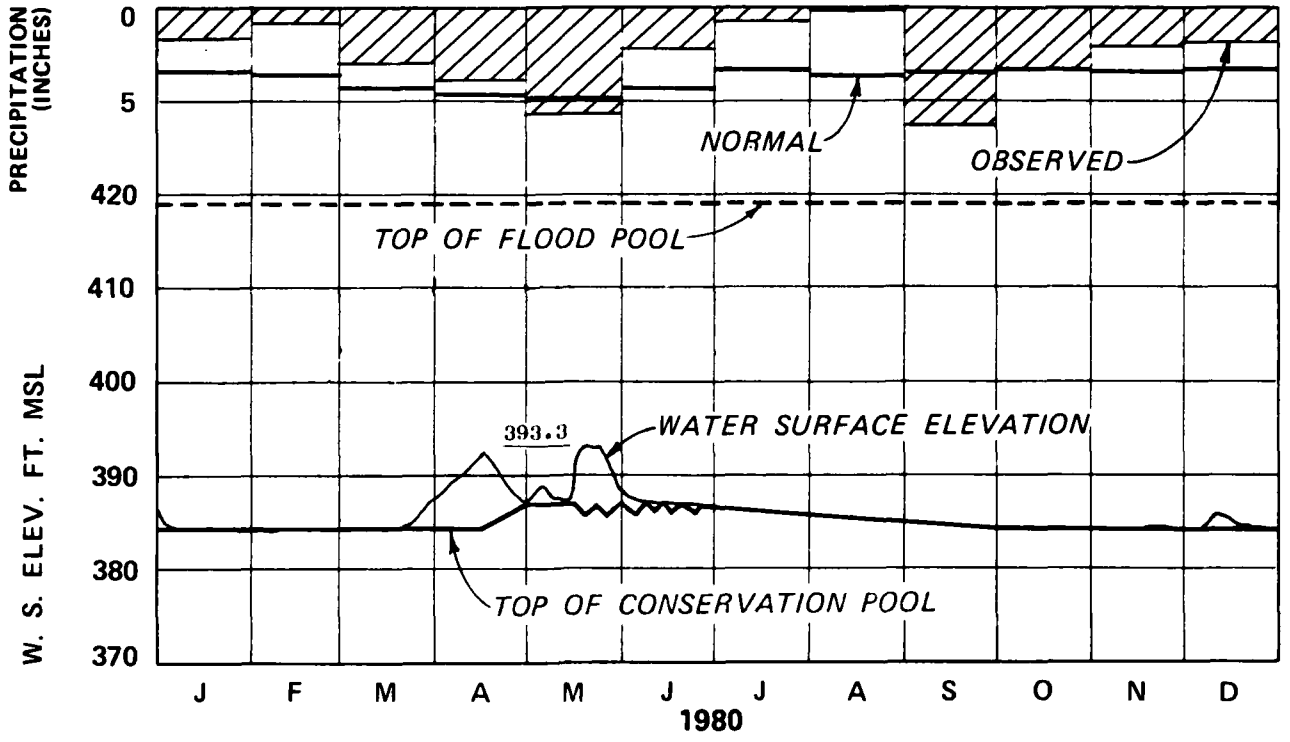


PLATE 14

BLUE MOUNTAIN LAKE



NIMROD LAKE

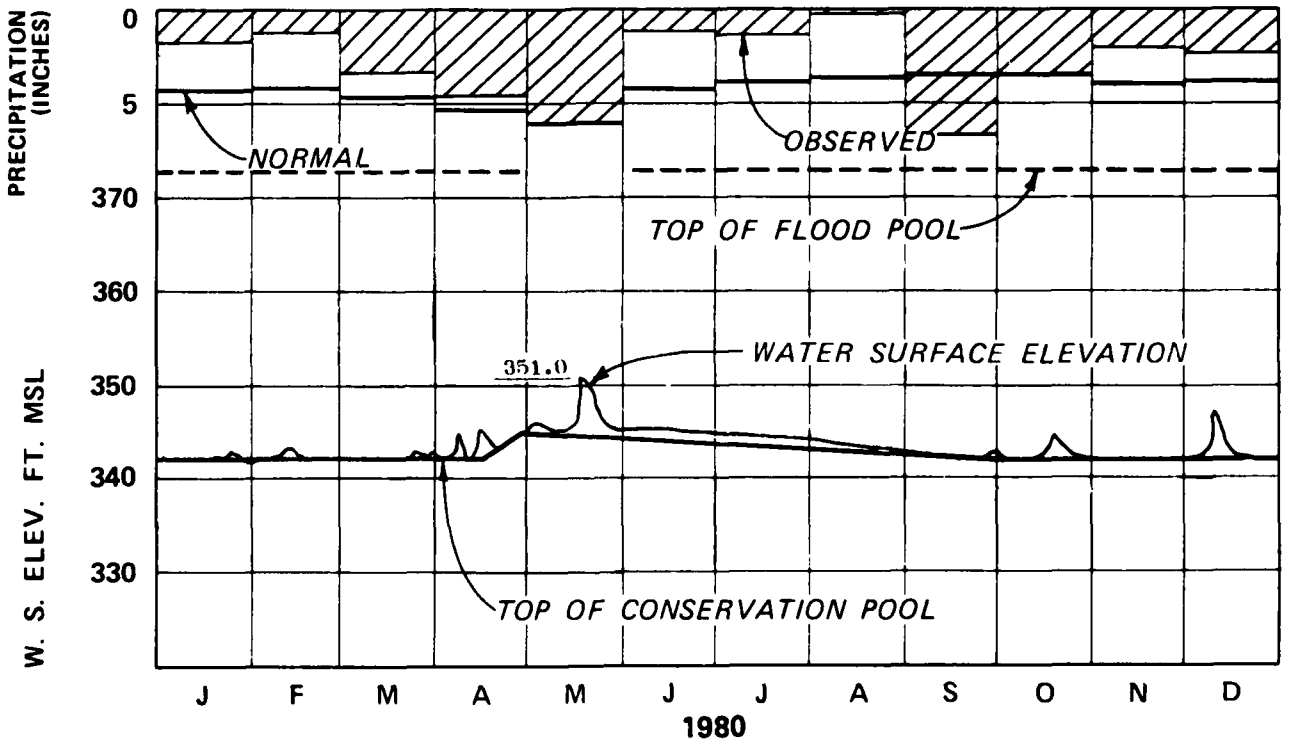


PLATE 15

FLOOD DAMAGES PREVENTED

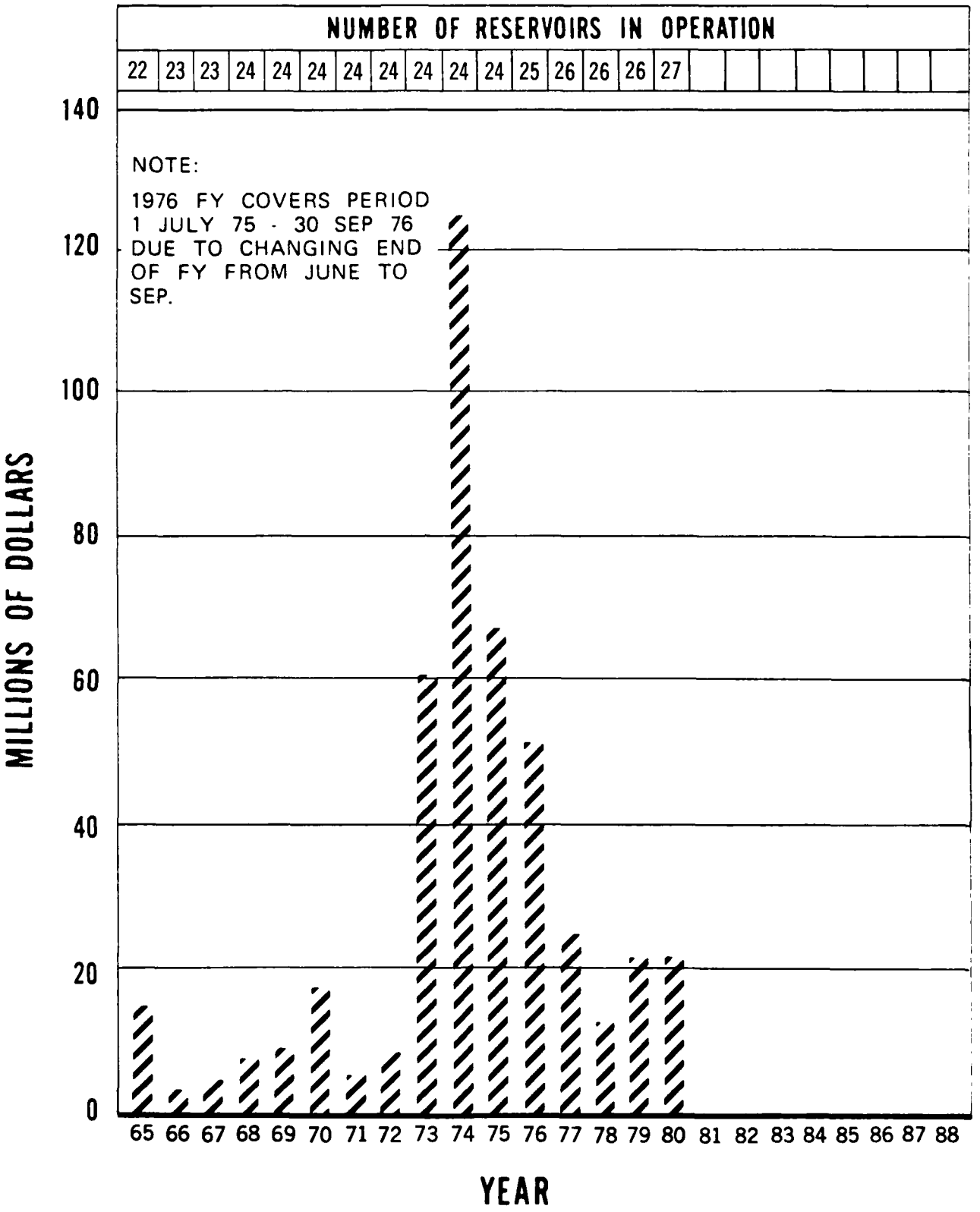
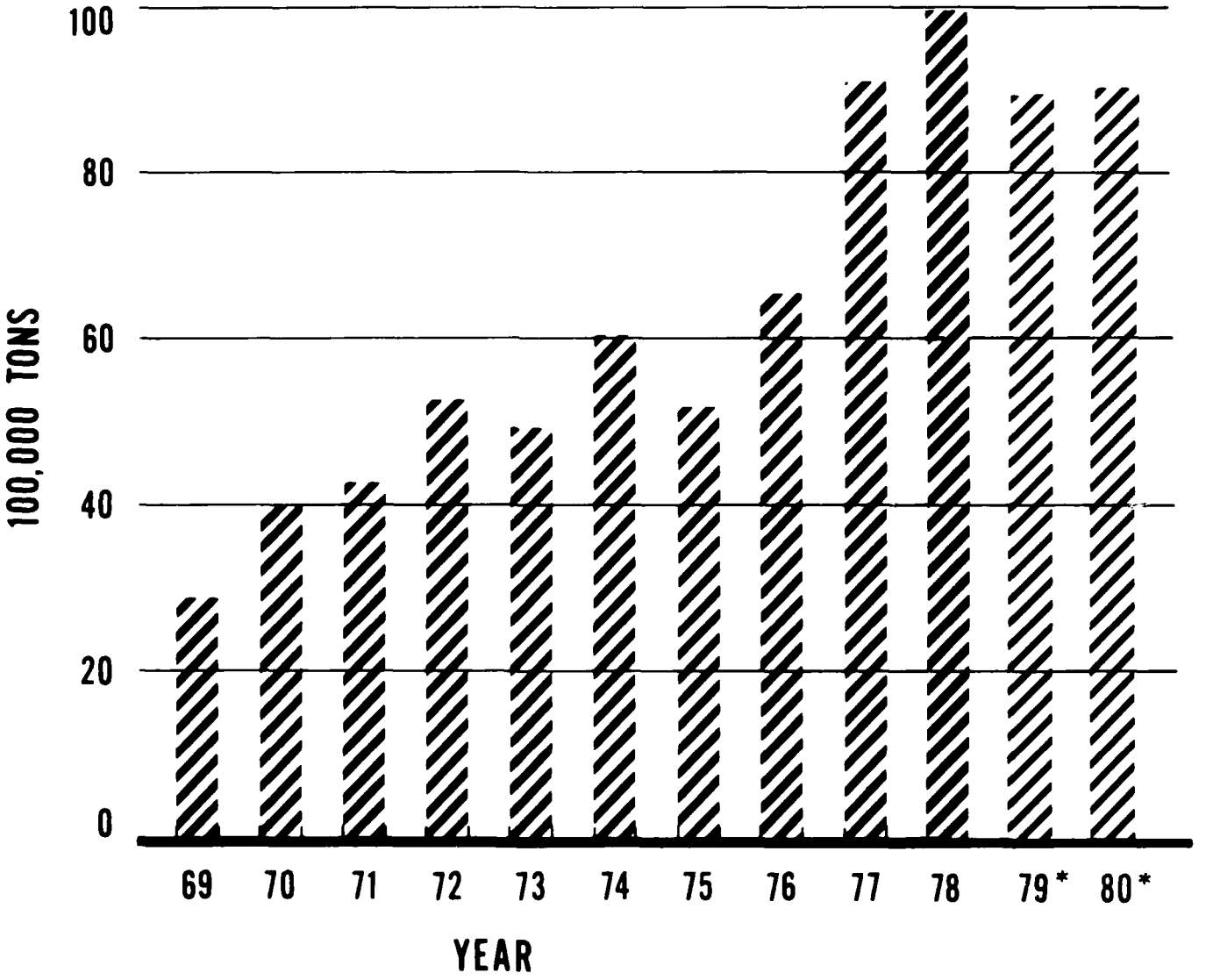


PLATE 16

FREIGHT TRAFFIC
McCLELLAN-KERR ARKANSAS RIVER NAVIGATION SYSTEM
MOUTH OF WHITE RIVER TO PORT OF CATOOSA, OKLA



*Tonnage for 1979 & 1980 based on preliminary estimates.

PLATE 17

KEYSTONE

PLATE 18

FT GIBSON

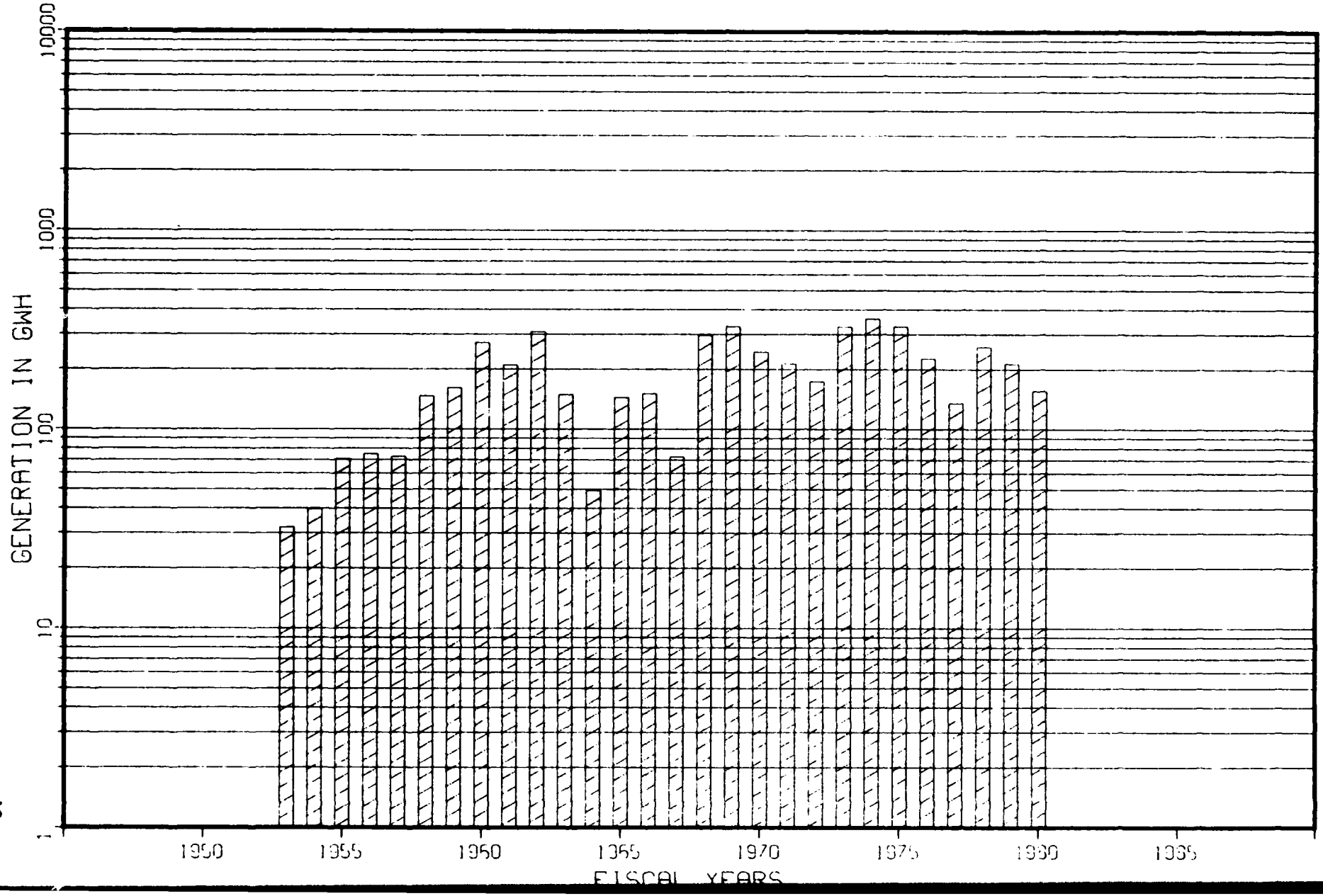


PLATE 19

WEBBERS FALLS

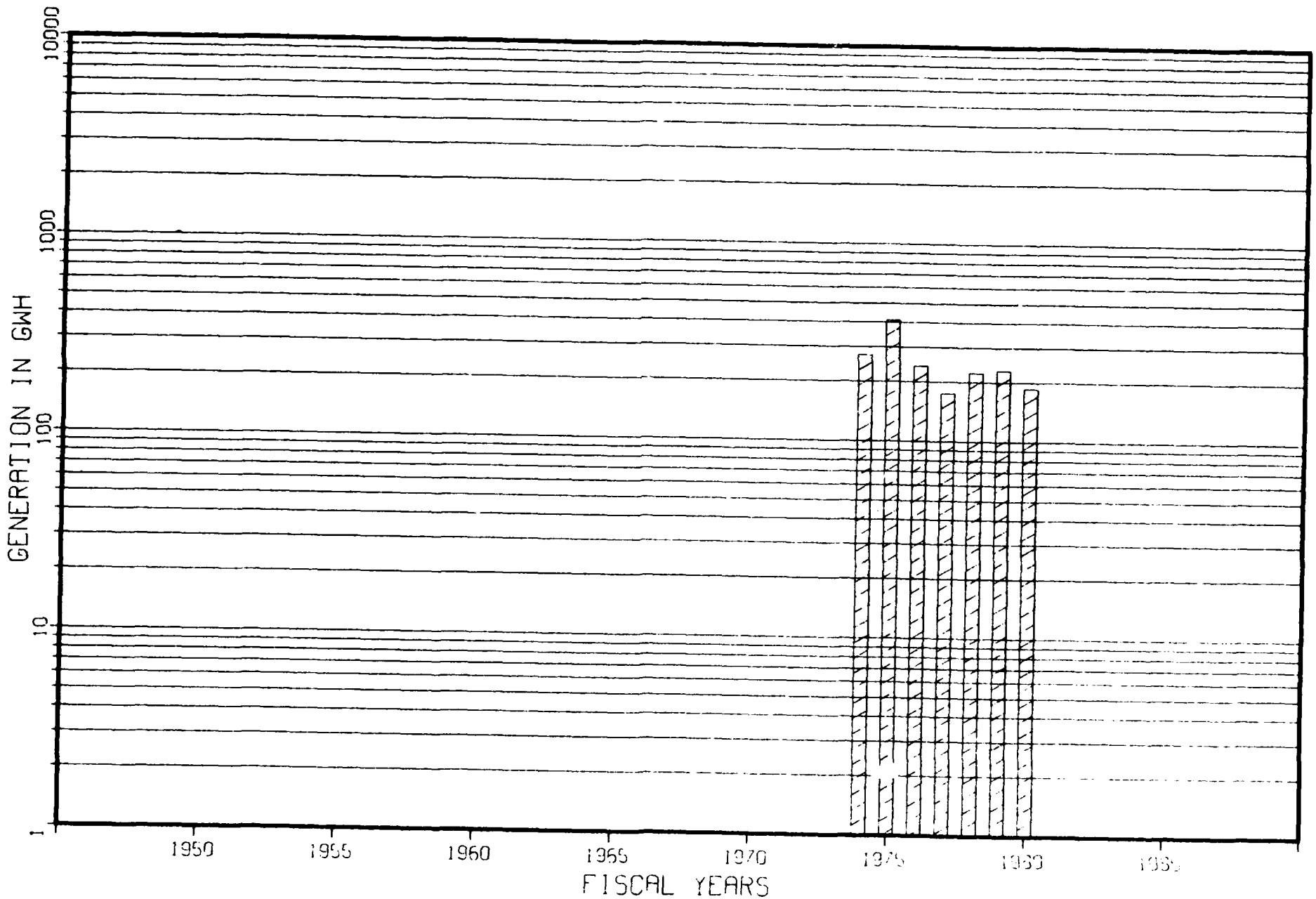


PLATE 20

TENKILLER FERRY

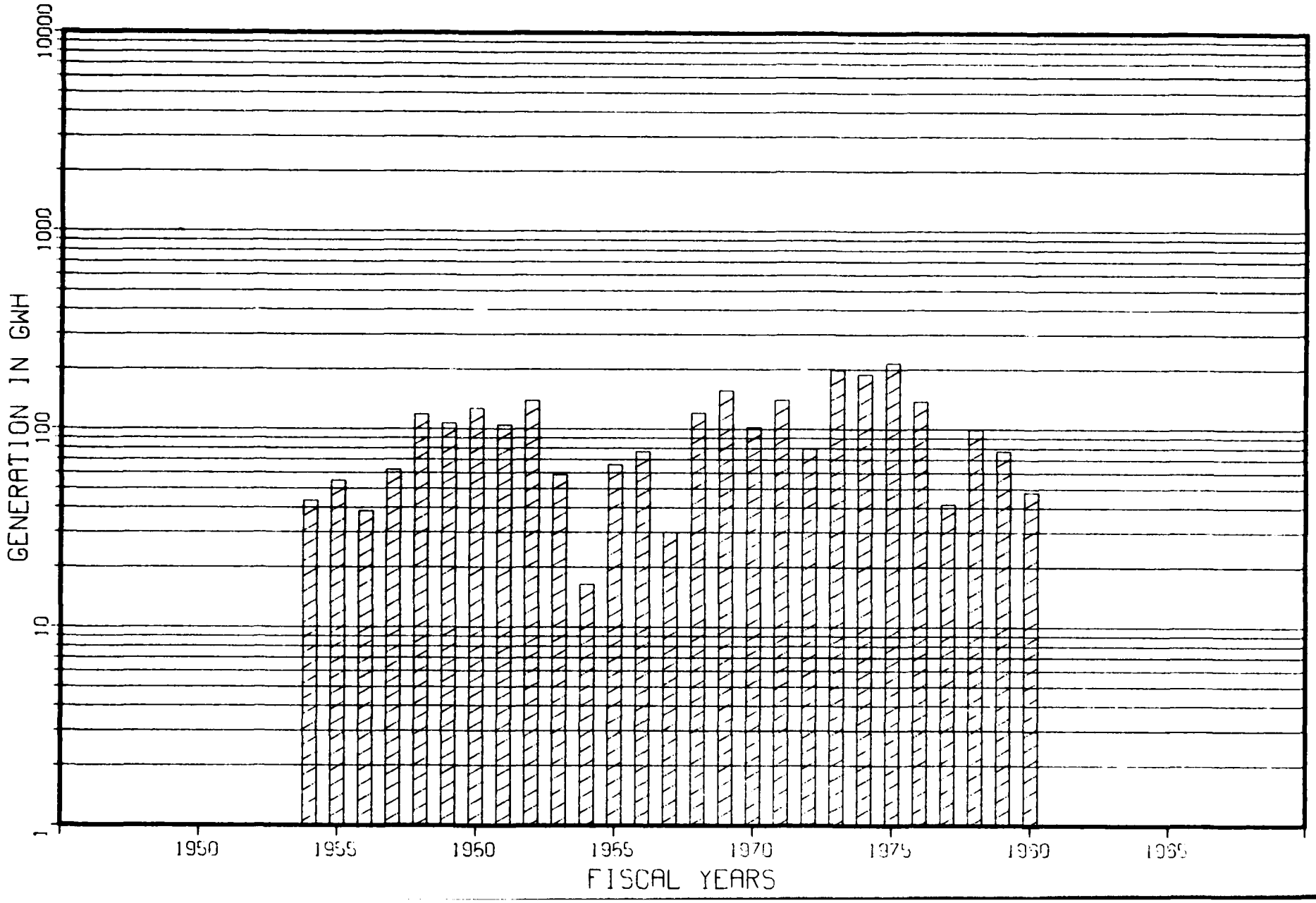


PLATE 21

EUFAULA

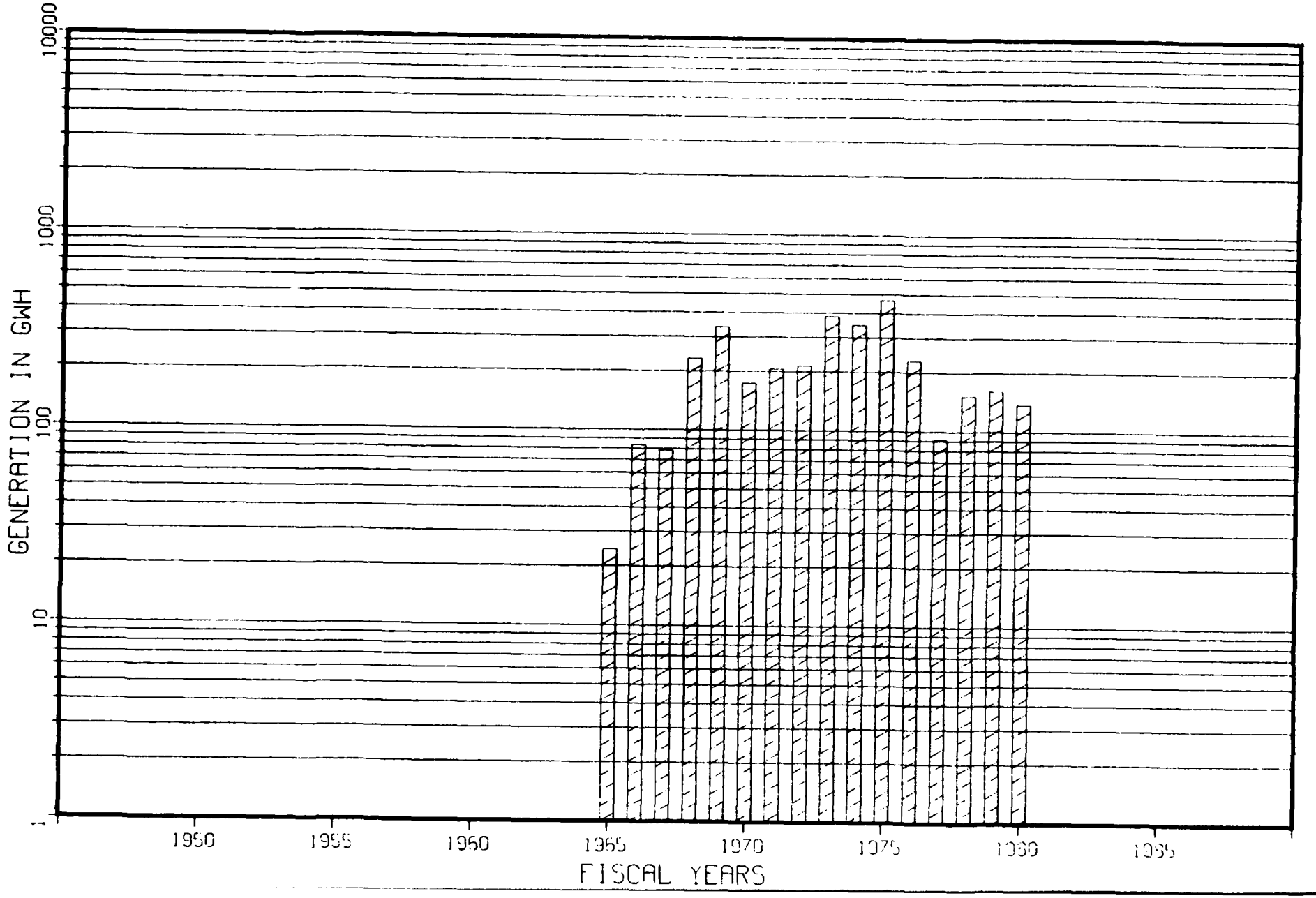


PLATE 22

R S KERR

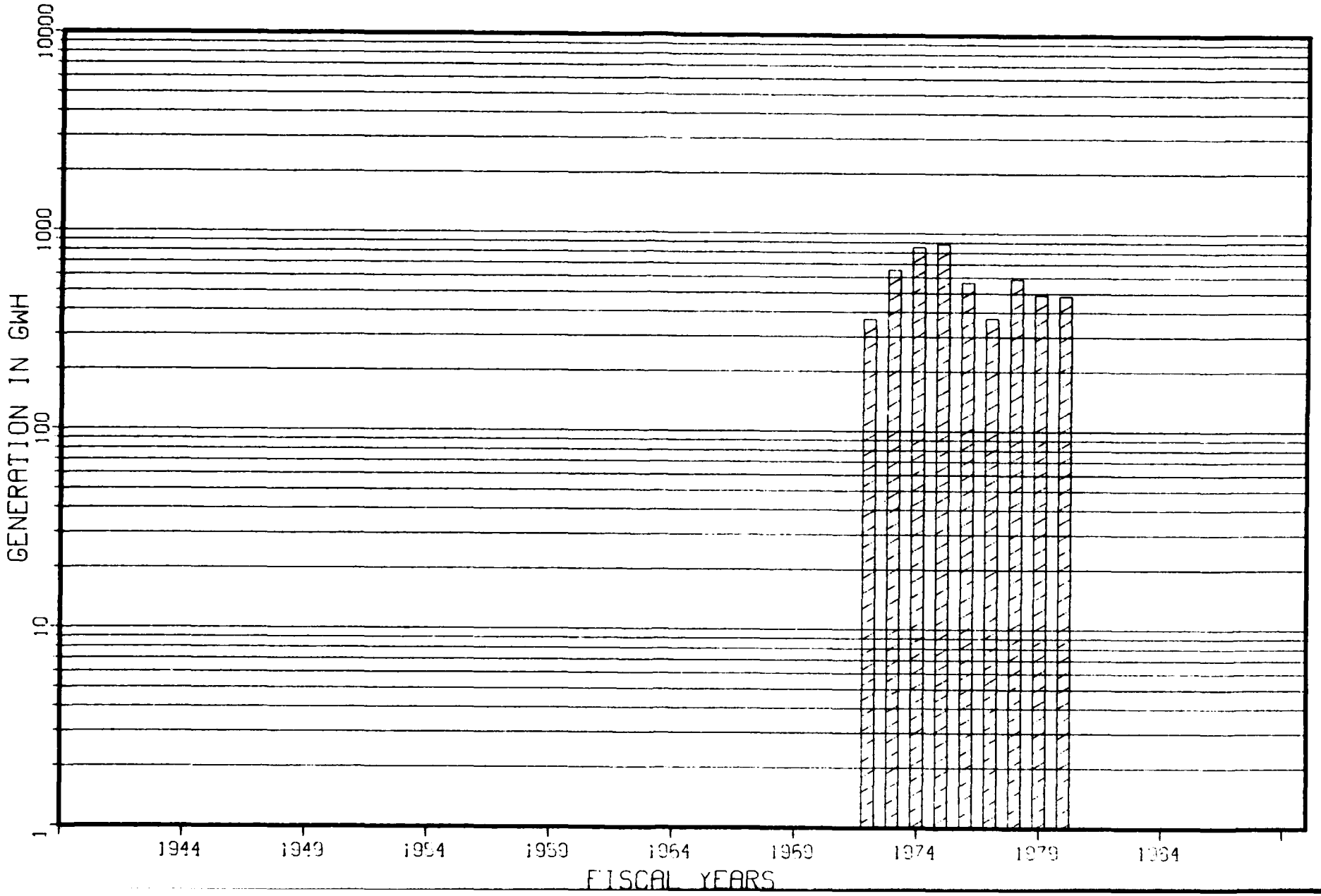


PLATE 23

OZARK

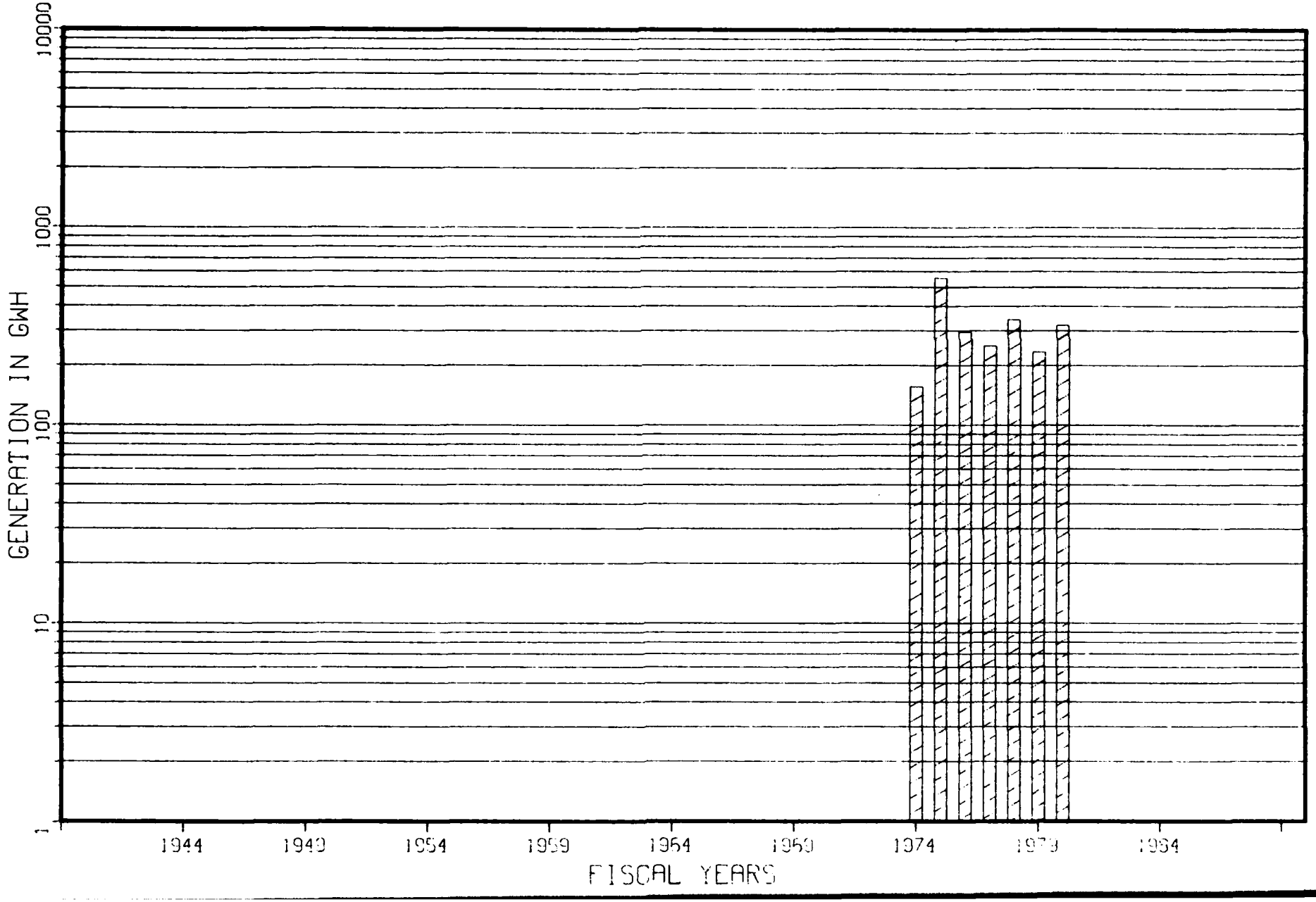


PLATE 24

DARDANELLE

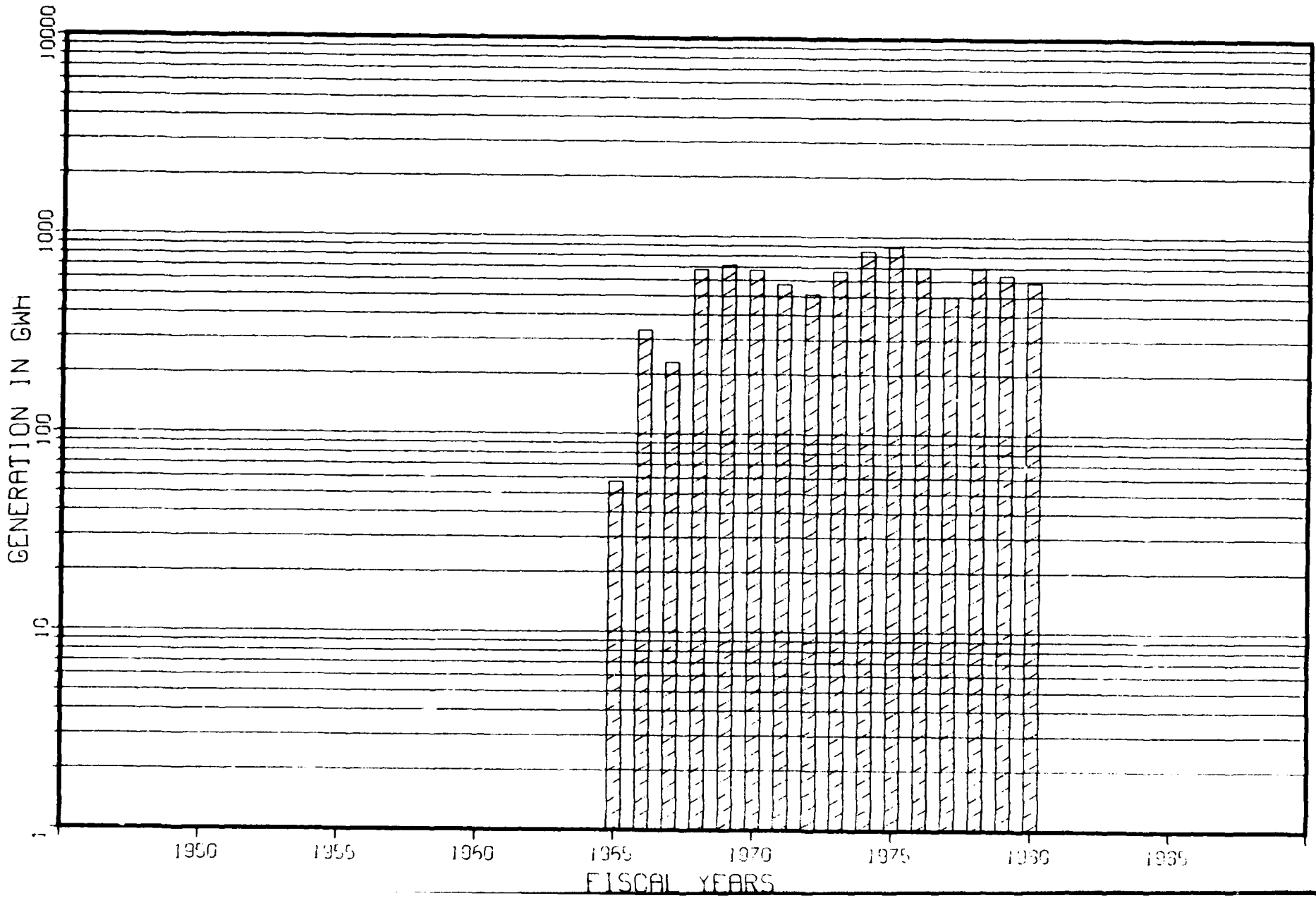


PLATE 25

MINUTES

Arkansas River Basin
Coordinating Committee Meeting
16 April 1980

1. Introduction. Mr. R. Terry Coomes, Chairman of the Committee, opened the meeting and introduced those in attendance. A list of attendees is furnished on inclosure 1. The primary purpose of this meeting is to provide an opportunity to coordinate the water control activities in the Arkansas River Basin with the state and Federal agencies. The annual report provides a review of the activities and, in a number of instances, provides a preview of activities for the coming year.

2. Review of 1979 Operations.

a. Above Fort Smith. Mr. Ross R. Copley, Corps of Engineers, Tulsa District, reviewed the operations above Fort Smith. Generally, the flows for the basin were below normal. Flows past the Van Buren gage were below normal. However, there were some good runoff producing storms in March, May, June, and November. At Fort Supply, the pool reached it's highest since 1957. Chaney Lake (Bureau of Reclamation) reached it's highest pool level of record. We ran several navigation tapers during the flood season and these were very successful. The seasonal pool operations at the Kansas lakes were continued. This is for fish and wildlife benefits. Last year over 20 million dollars of flood damage were prevented. The tonnage on the navigation system was down slightly from 1978. The power production was up compared to the 5-year average. Recreation attendance at the lakes was down slightly. This decrease in attendance was primarily due to effects of the energy shortage. The water supply uses were up about 29 percent from 1978. The Tulsa District completed detailed water quality studies on Fort Gibson, Tenkiller, and Kaw. Also, detailed studies were initiated on Oologah, Fall River, Elk City, Birch, Heyburn, and Hula. The final report on these is expected in September of 1980.

The status of projects under construction is as follows:

Project	Diversion through Outlet Works Schedule	Impoundment Schedule
Big Hill	Jun 80	Jun 81
Copan	Jul 80	Jul 82
El Dorado	Apr 80	Dec 80
Skiatook	Jun 81	Oct 82

Candy - this project is on hold until Congress makes a decision concerning a claim on the mineral rights.

b. Below Fort Smith. Mr. William E. Isaacs, Corps of Engineers, Little Rock District, reviewed the operations below Fort Smith. Above normal rainfall occurred at the two tributary projects and along the Arkansas River below Fort Smith. The rainfall at Fort Smith was over 7-1/2 inches above normal and at Little Rock was over 4 inches above. However, there were not any major floods. The regulation plan and navigation taper worked real well and navigation was able to get the necessary dredging done without any problems. Arkansas reported 2.43 million pounds of commercial fish caught in the Arkansas River with a value of $830,000. Blue Mountain Lake prevented over 1 million dollars in flood damages and Nimrod Lake prevented $757,000 worth of damages, and there was $2,930,000 of flood damages prevented along the main stem of the Arkansas River (upstream reservoirs and levees). There was some decrease in the navigation tonnage, and it is felt that this was primarily due to the economy. Flows on the river were generally good for support of navigation traffic. Maintenance dredging was about 0.4 million cubic yards less than 1978. There were a few minor navigation accidents but no major damage was experienced. 1979 was the best year for hydropower production since 1975.

The Little Rock District had a lake and shore cleanup in September that was highly successful. Hopefully, this will become an annual event. It was also noted that, in general, the lake attendance was not down for the projects below Fort Smith.

3. Occurrence and Effects of PCB Contamination. Mr. David L. Olschewsky, Environmental Protection Agency (EPA), Region 6, Dallas, Texas, presented a discussion on polychlorinated biphenyls (PCB's). PCB's are produced by the clorination of a biphenyl molecule with annydrous chlorine. Almost all PCB's in existence today have been synthetically manufactured. Production began about 1929. PCB's are generally heavy liquid, oil-like substances and weigh about 10-12 pounds per gallon. The primary use of PCB's has been in electrical transformers, capacitors, heat transfer systems, and hydraulic systems. Other uses include paints, adhesives, caulking compounds, lubricants, inks, carbonless copy paper, coatings, and dust control agents.

It is estimated that 20 percent of all PCB's that have been produced are still in service. Five percent have been vaporized but not destroyed by burning; ten to fifteen percent have been discharged in fresh or coastal waters, fifty-five percent disposed in dumps and incinerators, ten to twenty percent being destroyed by incinerators. Low temperature incineration can create a contaminant more toxic than PCB, Dibenzo-Furans. Once PCB's are released into the environment, they are very stable and accumulate in organisms throughout the environment.

There are tests which show PCB's cause, among other things, reproductive failures, gastric disorders, skin lesions, and tumors in laboratory animals. Workers exposed to PCB's have shown a number of symptons and adverse effects including, but not limited to, chloracne and other epidermal disorders, digestive disturbances, jaundice, impotence, throat and respiratory irritations, and severe headaches.

EPA now has a regulation requiring the disposal of PCB's in an EPA approved chemical disposal site or by high temperature incinerators.

Additional information is contained in a booklet distributed at the meeting entitled "EPA's Final PCB Ban Rule: Over 100 Questions and Answers to Help You Meet these Requirements," dated June 1979.

4. Status and Impacts of PCB at Fort Gibson Lake. Mr. Richard G. Hunter, Corps of Engineers, Tulsa District, stated the reason for studying the lake was the proposal to add additional hydropower facilities and addition of municipal water supply. Therefore, a water study was required to see if the project was suitable for municipal water supply. Therefore, the District prepared a water quality study and also looked at the fish to determine if any toxic substances were present. The findings were that the water is of excellent quality and most contaminants in the fish were low. However, the PCB's were discovered in the fish--primarily in the types that feed on the bottom. The amount of contamination was generally low except for fish taken out of Pryor Creek. The primary area of contamination appears to be in the Pryor Creek area with the contaminants coming from a part of the Pryor Creek industrial park.

After this PCB contamination was discovered, other state and Federal agencies which have an interest in water quality were notified.

Additional sediment samples were taken to determine the areas of contamination. After these were mapped methods of disposing of this material were explored. One thought was to dredge out the hot spots. However, it was decided the concentrations were not such that dredging would be feasible.

During 1979, the tourist industry in the area projected that they lost about 34 million dollars due to the PCB problem.

5. Instream Flow Activities. Mr. David R. Brown, Corps of Engineers, Southwestern Division (SWD), presented a discussion of the instream flow requirements. In a June 1978 message to Congress, President Carter expressed concern for protecting the nation's instream flow. A month later a memorandum was issued to Federal agency heads to provide increased cooperation with the states and leadership to protect groundwater, to improve, where possible, operation of existing water resources projects and of future dams and other facilities to protect instream uses. He asked that Federal agencies, working in cooperation with the states, set a strong example in recognizing and protecting instream flow needs.

A task force consisting of representatives of several Federal agencies was established and charged with setting guidelines for determining instream flow needs. At the present, they have only addressed the physical conditions. One of the major problems being encountered is trying to develop general guidelines that can be applied to many different geographic areas and the many varied purposes the water resources projects have to serve such as flood control, navigation, hydropower, recreation, water supply, etc. Instream flow uses are defined as all beneficial uses of water in the stream channel. The definition of instream-flow requirements is "the flow regime necessary for

all of the individual and collective instream uses of water, including an acceptable range of water quality." There are four general categories in the instream flow problems: (1) quantity, (2) quality, (3) physical barriors, and (4) flow fluctuations. The problems can be a combination of any or all of these categories.

We will soon be getting started on a project-by-project evaluation of all existing Corps projects. This will be used to assess the magnitude of existing instream-flow related problems and needs and will serve as a basis for establishing priorities for meeting these needs. Evaluations of all projects must be completed and submitted to OCE as part of the Annual Division Water Quality Reports by 1 February 1981.

6. Report on Oklahoma Comprehensive Water Plan. Mr. Mike Melton, Oklahoma Water Resources Board, presented a summary of the Oklahoma Comprehensive Water Plan. Mr. Melton distributed copies of publication 94-S titled "Synopsis of the Oklahoma Comprehensive Water Plan" dated January 1980.

In 1974, the Oklahoma legislature assigned the Oklahoma Water Resources Board the task of designing a statewide plan to meet the current and long-range water needs of the entire state. The need for a statewide plan recognized the state water problems which included: (1) depleting groundwater supplies, (2) increasing M&I needs, (3) inadequate distribution system, (4) water quality, and (5) flooding.

The plan was developed pursuant to relevant state and Federal legislation, policy and guidelines, setting forth the following goals:

(1) To promote economic opportunity and development.

(2) To preserve and enhance the environment.

(3) To protect lives and property from floods.

(4) To expand agricultural production and agribusiness activity.

(5) To develop recreational potentials.

(6) To maintain and improve water quality.

(7) To encourage water conservation.

(8) To place excess and surplus water to beneficial use.

(9) To encourage and provide for public participation in water resources planning.

The presentation also included information on regional water development plans, water conveyance systems, considerations related to future development, cost-benefit information, and conclusions. Details of these items have not been presented in these minutes but may be found in the above referenced publication 94-S.

7. Sub-Topics.

a. Arkansas River Basin Master Manual. Mr. Charles Sullivan, Corps of Engineers, SWD, reported that the Arkansas River Basin Water Control Master Plan is in final form and is scheduled for printing in June 1980. The manual has been a joint effort and will be submitted jointly by the Tulsa and Little Rock Districts to SWD for approval. After the manual has been approved and forwarded to the Office of the Chief of Engineers, copies will be available, upon request, by others who have an interest in the plan of regulation for the Arkansas River Basin projects. This plan is the result of efforts which began in late 1973. This update of the System Regulation Plan was brought about primarily because of the energy crisis, flow regulation requirements to better serve navigation needs particularly following large rises, and the effectiveness of the flood control system being reduced in recent years because of the loss of channel capacity in the vicinity of Van Buren, Arkansas. During this study period, the projects have been regulated under several interim plans.

b. Van Buren Land Acquisition Progress. Mr. Ross Copley reported on the progress of this activity. A study was made to determine alternative ways to restore the capabilities to operate at about 150,000 cfs in the Van Buren reach. The study indicated that probably the best way to maintain this capability was to buy flowage easements on the land that would be flooded for increased duration. Net damage areas were defined and located. These were areas that were not being benefited by project operation and were being damaged due to the increased flow duration. There are about 4500 acres of this land. Little Rock District will prepare the real estate DM and hold public meetings to explain the acquisition of flowage easements to the local interest. The schedule is for the real estate DM to be completed by July 1980, hold public meetings in September 1980, and start acquisition of flowage easements in October 1980. However, actual acquisition will be dependent on availability of funds.

c. Memo of Understanding, SWPA and Corps of Engineers. Mr. Coomes reported that in January 1977 there was quite a conflict between SWPA (the power marketing agency) and the Corps regarding management of the power storage in the Corps projects. Following that, SWD was instructed by the Chief of Engineers to negotiate a memorandum with SWPA to clarify the role of the agencies in the case of the storage. This has been done and at the staff level the various parties are satisfied with the document. However, the policy people in the Washington level still have some concern over the authority of the agencies under the condition of declaration of a power emergency. They want to be assured that an emergency cannot be declared as a result of shortages resulting from marketing considerations. It is hoped that these differences can be resolved by fall. After the memo is signed, the detailed operating criteria will be worked out.

d. Status of the Water Control Data System. Mr. John R. Parks, Corps of Engineers, SWD, reported that since the meeting last year the Master Plan for the system had been approved by the Chief of Engineers Office. This gave us the authority to begin detailed design of the system and request funding. We are currently preparing design documents for submission to the

Chief's office and plans are to go on the street for bids on the ADP portion of this system this fall. The completion of automation of the data collection and processing is scheduled for FY 1984.

e. Status of Arkansas Hydropower Study. Mr. Coomes reported that we have authorization to review the installation of hydropower facilities at all of the Arkansas River Locks and Dams that presently do not have these facilities. The study approach was to take the Murray Lock and Dam in the Little Rock District and W. D. Mayo Lock and Dam in the Tulsa District first. The studies are to consider that these will be run-of-the-river operations. The units being evaluated are bulb units of about 6 MW. The capacities of the projects are looking like about 25-50 MW. The studies began in October 1979 and draft survey reports are expected to be completed in August 1980 with the final survey report complete in October 1980. The earliest potential construction start would be 1982.

f. Protection of Water for Navigation Purposes. Mr. Coomes reported on the current Corps position concerning the protection of water for navigation and power. It is the conclusion that, of the Corps legal staff, that the agency may not file for a water right for navigation nor power water. This is prohibited by the O'Mahoney-Milliken Amendment to the Flood Control Act of 1944. The Corps may, however, prevent water withdrawals when access is required across Corps lands or if such access is granted may require a water withdrawal contract. The Corps policy on granting access to water users is not totally resolved at this time.

ATTENDANCE LIST

Arkansas River Basin Coordinating Committee
16 April 1980

	Name	Organization	Telephone No.
1.	Terry Coomes, Chairman	Corps of Engineers, SWD	FTS 729-2385 COM 214-767-2385
2.	Charles Sullivan	Corps of Engineers, SWD	FTS 729-2388 COM 214-767-2388
3.	John R. Parks	Corps of Engineers, SWD	FTS 729-2387 COM 214-767-2387
4.	David R. Brown	Corps of Engineers, SWD	FTS 729-2384 COM 214-767-2384
5.	Walter B. Gallaher	Corps of Engineers, SWD	FTS 729-2303 COM 214-767-2303
6.	Kenneth L. Waldie	Corps of Engineers, SWD	FTS 729-2431 COM 214-767-2431
7.	Jack T. Chowning	Corps of Engineers, SWD	FTS 729-2432 COM 214-767-2432
8.	Carroll Scoggins	Corps of Engineers, TD	FTS 736-7208 COM 918-581-7208
9.	Ross Copley	Corps of Engineers, TD	FTS 736-7669 COM 918-581-7669
10.	Richard G. Hunter	Corps of Engineers, TD	FTS 736-7858 COM 918-581-7858
11.	William E. Isaacs	Corps of Engineers, LRD	FTS 740-6231 COM 501-378-6231
12.	Arthur Martin	Federal Energy Regulatory Commission	FTS 334-2633 COM 817-334-2633
13.	Tom Dennis	Soil Conservation Service	FTS 740-5444 COM 501-378-5444
14.	Bill Seth	Dep't of the Interior - Water & Power Resources	FTS 728-9465 COM 806-378-5465
15.	Oscar E. Hembree, Jr.	Southwestern Power Administration	FTS 736-7225 COM 918-581-7525
16.	Mike Melton	Oklahoma Water Resource Bd	405-271-2520
17.	David L. Olschewsky	Environmental Protection Agency	FTS 729-3274 COM 214-767-3274
18.	Alan D. Fortenberry	Arkansas Soil & Water Conservation Commission	COM 501-371-1611